Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

MAY 3, 1948
VOLUME 37, No. 9

AMERICAN DYESTUFF REPORTER

OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
AND COLORISTS

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is in process of development by a subcommittee of the American Association of Textile Chemists and Colorists as the result of understandings reached by said committee and our committee. We hope to complete the task by the fall of 1948 and discharge our committee.

1947, so that it would not be able to freely purchase and use yarns of its own selection and thus develop special constructions.

It was further deemed advisable to take more time to appraise the types of constructions preferred by the consumer.

developments and to be ready. They would be severely censured by all if they fell down on this obligation.

This Association during the last year has been in a number of conferences with representatives of the Industrial Mobilization Division of the Department of the

ed conditions. Either one or both of these possible developments would have their effect on all industry, ours included.

The mention of them here should be sufficient evidence that your National Association is alert to the possibilities and may be

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SOLOPHENYL GREEN STANDS ANTI-CREASE

In the past, mills requiring a really fast-to-light Green for Cotton or Rayon have been thwarted by the unavailability of one whose shade was affected in the minimum by the commonly employed urea formaldehyde anti-crease finishes.

Geigy Company, Inc., 89-91 Barclay Street, New York, has just announced the availability of a new (patented) green in their now widely-known Solophenyl series. Called Solophenyl Dark Green GBL, the color has been reported not only to give the extreme in light fastness but withstands the usually color destructive action of anti-crease finishing with a minimum of change. The makers indicate its use in producing such popular shades of green as Continental Green, Crushed Mint, Southern Moss and Precious Jade.

Geigy also announces the issue of Bulletin #9 G which illustrates Solophenyl Dark Green GBL on lustrous viscose, cotton, spun rayon and the effect of the dyestuff on mixed fibres.

Outstanding among the various properties tabulated therein are the color's fastness to perspiration, water bleeding, sea water and dry and wet cleaning.

GEIGY COMPANY, INC.

89-91 BARCLAY STREET — NEW YORK—NEW YORK

Boston · Philadelphia
Charlotte, N. C. · Portland, Ore.
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Geigy
Dyestuff Makers Since 1859

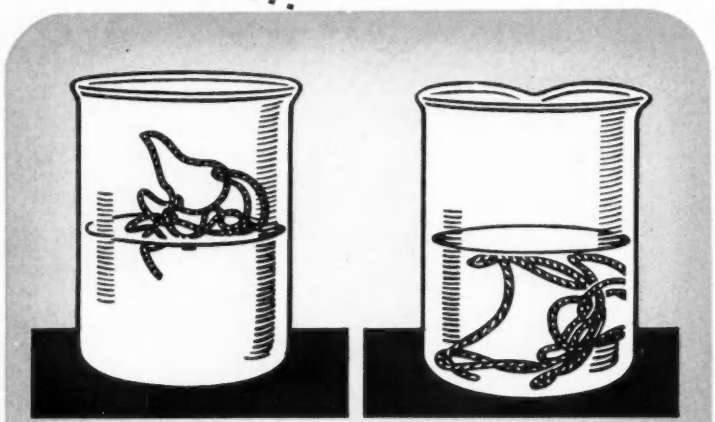
In Great Britain
The Geigy Co., Ltd.
National Buildings
Parsonage, Manchester

FOR IMMEDIATE SINKING IN WATER...

IN IMMEDIATE SUPPLY...

AND IMMEDIATE DROPPING IN COSTS...

STANDARDIZE AT THE QUALITY LEVEL WITH



An example of the unmatched performance of DECERESOL OT Wetting Agent. At left, yarn floats indefinitely on water. At right, one drop of DECERESOL OT Wetting Agent causes instantaneous wetting and immediate penetration.

...DECERESOL OT Wetting Agents

You get speedier application in the wetting of textiles – better penetration, dispersing and dye levelling properties – when you standardize on Cyanamid's DECERESOL° OT Wetting Agents, now again available in larger quantities.

But that is only *one* side of the story. DECERESOL OT Wetting Agents are also very economical to use. A little of it goes a long way. Its efficiency lowers costs, saves time.

And don't forget this *third* important advantage: the continual use of DECERESOL OT Wetting Agents results in *higher quality production*, as well.

If you are not now using DECERESOL OT Wetting Agents, it will pay you to write for further information about these superior wetting agents. Or, if you wish, one of our representatives will be glad to call and demonstrate DECERESOL OT Wetting Agents to you personally.

AMONG CYANAMID PRODUCTS FOR THE TEXTILE INDUSTRY ARE . . . AQUASOL.° Sulfonated Castor Oils; NO-ODOROL° Finishing Oils; DECERESOL° OT Wetting Agents; PARAMUL°° 115 Water Repellent; Penetrants, Softeners, Finishes, Sizing Compounds, and other specialties and Heavy Chemicals. For low-cost chemical equivalent of distilled H_2O . . . FILT-R-STIL° Demineralizing Units.

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°Reg. U. S. Pat. Off. °°Trademark

American Cyanamid Company

Industrial Chemicals Division

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

American Dyestuff Reporter, Vol. 37, No. 9, May 3, 1948. Published every other Monday. Copyright, 1948, by Howes Publishing Co., Inc., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00; Foreign, $10.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

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a new and superior cationic softener for all fabrics

it combines the most in softness and fullness with the least in shade change and effect on light fastness.

IF one of these is your problem, investigate

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1. Yarn softening — package or skein
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3. Static
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5. Modifying resin finishes
6. Softening chlorinated or shrinkproof wool yarn

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JUST TURN A VALVE to "PASS the SALT" ANYWHERE IN YOUR PLANT

Put an end to SALT HANDLING *with The* LIXATE PROCESS *for making brine*

Weigh these production savings:

- **Eliminates shoveling salt from storage**
- **Ends hauling salt around the plant**
- **Saves time wasted in making brine**
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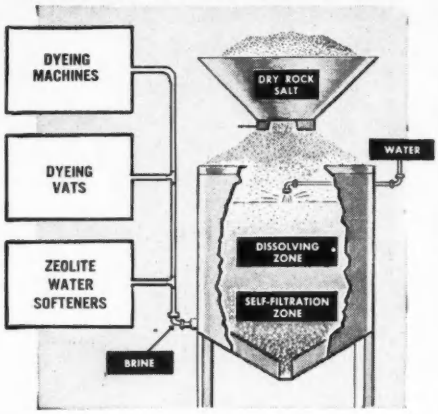
ECONOMICAL LIXATE BRINE made from Sterling Rock Salt has brought users savings as high as 20%. Completely automatic, the Lixator can be placed right at salt delivery or storage point. It supplies 100% saturated, free-flowing, crystal-clear brine by common steel piping to as many points in your plant as you wish . . . over any distance . . . by gravity flow or conventional pump and piping equipment. You simply turn a valve for pure, self-filtered brine that meets the most exacting chemical and bacterial standards for every salt need. It will pay you to investigate the Lixate Process for your plant.

HOW THE LIXATOR WORKS



In the upper zone—Flowing through a bed of rock salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. **In the lower zone**—Through use of the self-filtration principle *originated by International*, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

WHAT THE LIXATOR PROVIDES

- ✔ **Chemical and bacterial purity to meet the most exacting standards for brine**
- ✔ **Unvarying salt content of 2.65 pounds per gallon of brine**
- ✔ **Crystal-clear brine**
- ✔ **Continuous supply of brine**
- ✔ **Automatic salt and water feed to Lixator**
- ✔ **Inexpensive, rapid distribution of brine to points of use by pump and piping**

Completely flexible, a Lixate installation can be made to supply any needed brine requirement. No costly investment is required. The Lixator pays for itself out of savings. See how others have saved—write now for your copy of "The Lixate Process for Making Brine."

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The LIXATE *Process*

Reg. U. S. Pat. Off.

for making brine

INTERNATIONAL SALT COMPANY, INC.

Scranton, Pa.

RAPIDASE
for de-sizing

The dependable, rapid and economical de-sizing agent for cottons, rayons and mixed goods. Applicable over a wide range of processes, temperatures and speeds.

HAS PROVED PARTICULARLY SUITABLE FOR CONTINUOUS DE-SIZING

WALLERSTEIN COMPANY, INC. • 180 MADISON AVENUE • NEW YORK 16, N. Y.

For Improved SIZING and STIFFENING of Fabrics

XYNO RESINS

Xyno Resins are water dispersions of thermoplastic synthetic resins. Goods are treated with these resins in the usual manner, without need for curing or high temperature setting of the resin. They contain no solvents, and are stable at all dilutions. They do not putrefy, and impose no hazards of toxicity or inflammability. Xyno Resins are compatible with alkalies, dilute acids and hard water.

Ask for Onyx Technical Data Sheets on Xyno Resins AA 40, S 69 and 362.

XYNO RESINS dry to clear, tough films which do not impair luster. They can be manipulated, alone or in combination, to impart a wide range of stiffness from extreme to moderate. They are also used with other Onyx finishing agents to obtain special effects.

Xyno Resin 362 is a viscous resin dispersion, giving the stiffest hand. It has been unusually successful on organdies, ninon and marquisettes, and is in extensive use on cotton, rayon, acetate and nylon constructions. It can be used with such softeners as Onyx Stearo Glyceryl Sulfate, Silk-O-Ray and Mapromol HSY for special effects.

Xyno Resin S 69 is a water-thin dispersion, offering a unique dry, "springy" hand, particularly attractive on nylon and other nettings. It offers the best wash fastness of all Xyno Resins. It can be used on all types of fabrics.

Xyno Resin AA 40 is a versatile, general purpose, water-thin dispersion in wide use for sizing and stiffening ribbons, dress piece goods, etc., in cotton, rayon and acetate. It is also used for linings and butcher linen. Xyno Resin AA 40 offers an interesting range of effects in body and stiffness.

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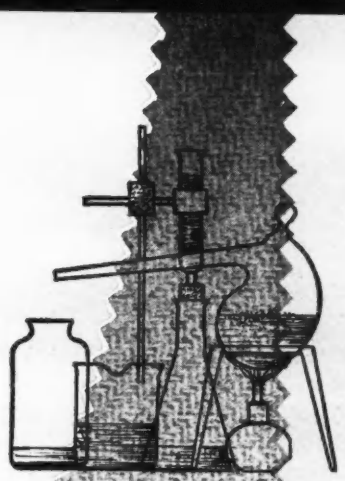

a **NEW** development applicable to all fabrics

REPCOLENE K-50

REPCOLENE K-50 has a wide field of application as a penetrating—scouring—wetting—leveling, dispersing and finishing agent

STABLE IN HARD WATER—COMPATIBLE WITH SOAP

REPCOLENE K-50 has great softening action on animal and vegetable fibres.

REPCOLENE K-50 is economical as it greatly reduces the amount of finishing compound required in scouring and dyeing operations.

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Canadian Selling Agents: Carbic Color and Chemical Co., Inc., 56 McNab Street South, Hamilton, Ontario

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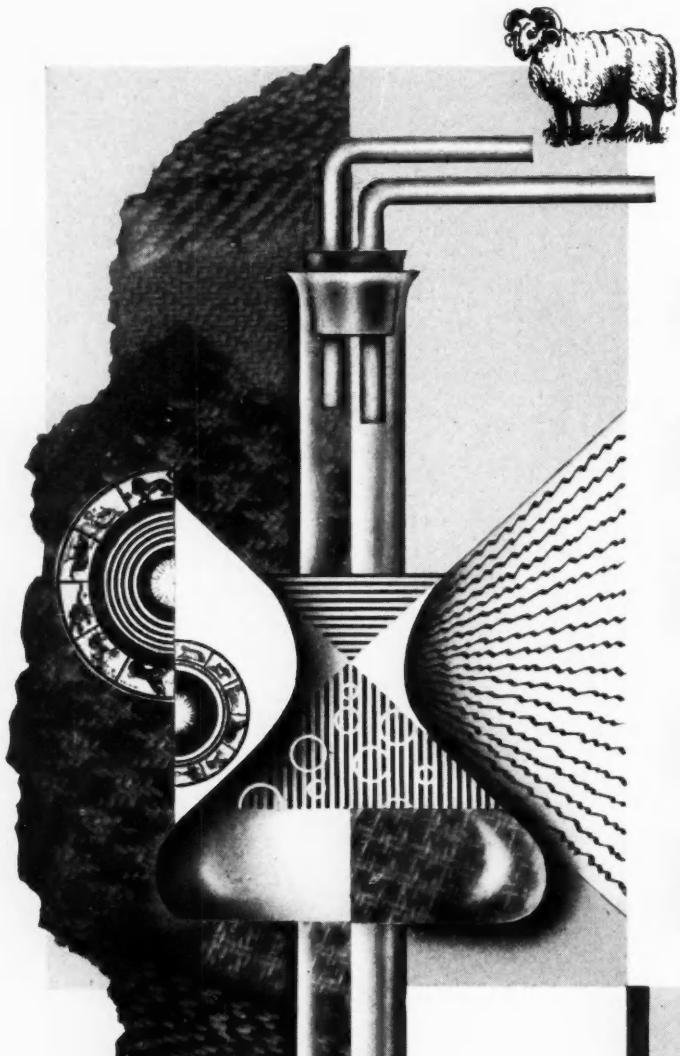

a new fabric is born

BUT...

How Will it Scour?

With a yard of your fabric in the grease we are in a position through our research laboratory to give you a complete detergency analysis. Join our many customers who are enjoying this service that offers you the most economical procedure for scouring your fabrics.

A Watson-Park representative will be glad to discuss your problems with you, or if you wish, just mail us the material you desire analyzed.

WATSON-PARK CO.
261 FRANKLIN ST. BOSTON, MASS.
FACTORY · LOWELL JUNCTION · MASS.

Improved SANTOMERSE No. 1

penetrates *FAST* ...spreads *THOROUGHLY*

Santomerse No. 1 has achieved wide use in textile dyeing operations because of its fast penetration and thorough spreading action, which are graphically illustrated in the photograph above... The right-hand glass contains water only, the water at the left contains a small amount of Santomerse No. 1. A drop of color added to each shows the quicker, more complete dispersion attained in the Santomerse No. 1 solution.

By breaking down the surface tension of water, Santomerse No. 1 provides the leveling effect needed in dye baths. It can be used prior to dyeing to wet out thoroughly and to assist penetration, or can be added directly to the dye bath... Because of its high detergency value and ease of rinsing, Santomerse No. 1 is also an excellent scouring agent for all fibres.

For complete information on Santomerse No. 1 applications in the textile and dyeing fields, send for application Data Bulletin No. P-118. Write to MONSANTO CHEMICAL COMPANY, Phosphate Division, 1700 South Second Street, St. Louis 4, Missouri, or simply return the coupon. District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Los Angeles, San Francisco, Seattle. In Canada: Monsanto (Canada) Limited, Montreal.

Santomerse; Reg. U. S. Pat. Off.

MONSANTO CHEMICALS

MONSANTO CHEMICAL COMPANY
Phosphate Division
1700 South Second Street, St. Louis 4, Missouri

ADP-2

Please send a copy of Application Data Bulletin No. P-118 on Santomerse No. 1 to:

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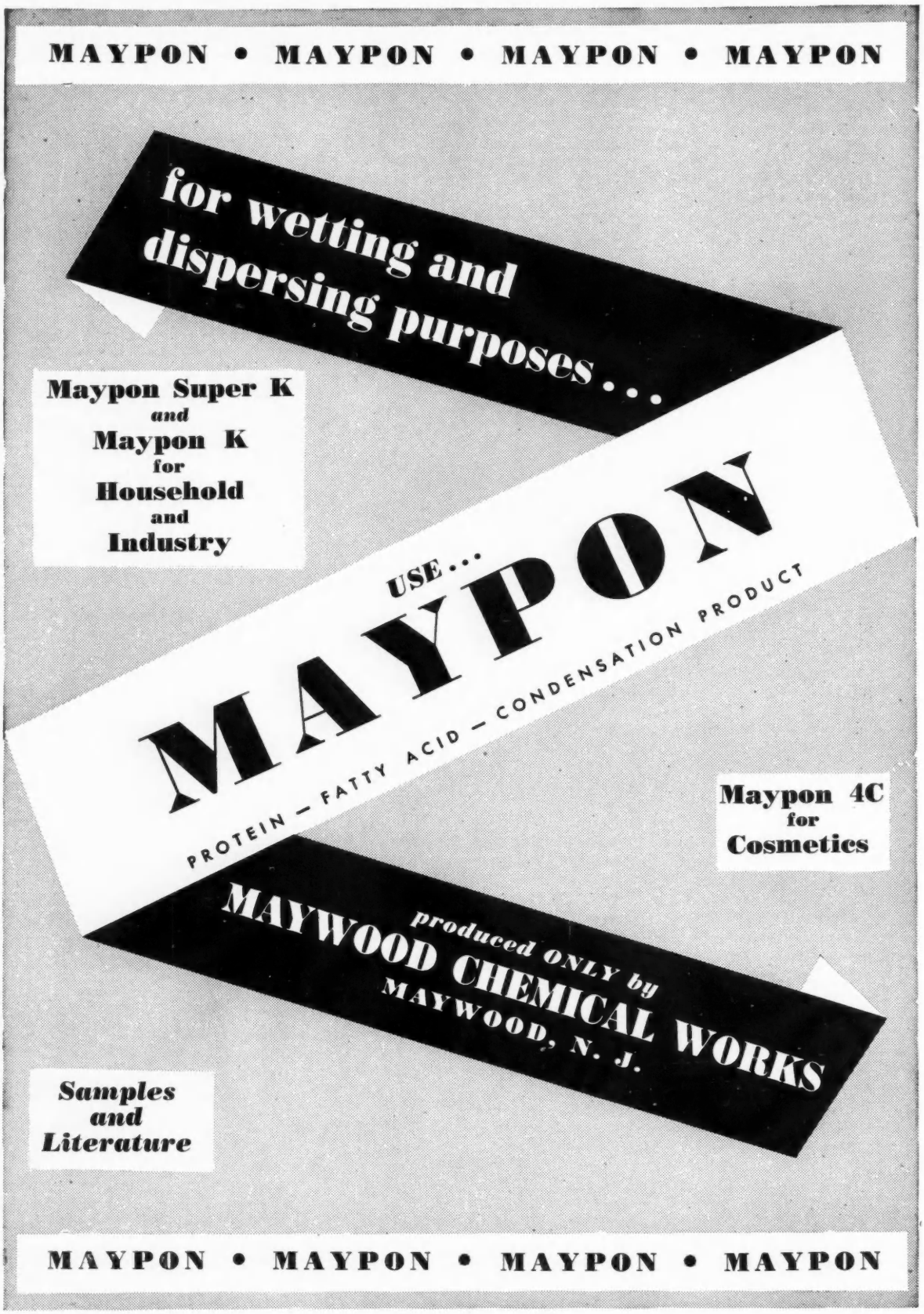
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for wetting and dispersing purposes . . .
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You're out ahead in fashion's gay parade of colorful prints and pastels when you use Keltex, the modern algin thickening agent.

Keltex promotes sharp, clean-edged printing; assures true, rich color values.

In both machine and screen printing Keltex gives exact printing paste viscosity and superior penetration. Ideally suited to the pad pigment method of vat dyeing, it effectively prevents migration of colors.

Keltex is super-refined and rigidly processed to give exact, unvarying results. Free of grit or other foreign matter. Economical and easy to use, it requires only a light wash for complete removal.

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For Uniform Results In Textile Wet Processing . . . Use Hooker Chemicals

Whatever the textiles with which you are working —cottons, woolens or synthetics—there are Hooker Chemicals that will make your work easier, and help you maintain high standards of quality.

That's because Hooker, too, maintains high standards of purity and uniformity in the chemicals it manufactures. Your bleaching, dyeing and finishing processes can be smooth and trouble-free, and your results consistently uniform when you use Hooker Chemicals.

Continued improvements in manufacturing processes and equipment, careful supervision and control, strictly maintained specifications of purity are tenets of Hooker operations. All these combine to bring you chemicals that make standardizing of your operations practical.

Some of the Hooker Dyestuff and Textile Chemicals and the principal Hooker specifications are listed below. More complete information and samples will be furnished when requested on your business letterhead.

Hooker Products List, Bulletin 100, contains chemical and physical characteristics, uses and shipping information on nearly 100 Hooker Chemicals, many of them for the textile and dye industries. Send for a copy.

PRODUCT *Chemical Formula; Molecular Weight*	**HOOKER SPECIFICATIONS**	**SUGGESTED USES**
Antimony Trichloride Anhydrous $SbCl_3$; 288.1	Antimony Trichloride..... 99% Min. Iron and Arsenic..... 1% Max. Lead..... 0%	Catalyst in organic synthesis; mordant in textile printing. Moisture and fireproofing textiles.
Benzal Chloride $C_6H_5CHCl_2$; 161.0	Clear, yellow liquid. Boiling Range..... 200 to 235°C Specific Gravity 15.5°/15.5°C..... 1.279 ± .005	Dyestuff intermediate.
Chloranisidine $NH_2C_6H_3ClOCH_3$; 157.5	Gray crystalline solid. Melting Point..... 79°C Min. Diazo Test..... Relatively clear.	Dyestuff intermediate.
Lauryl Pyridinium Chloride C_5H_5N $(C_{12.6}H_{26.2})Cl$; 292.0	Mottled tan, semi-solid. Solubility in water is 60 gms. per 100 gms. of water. Alkyl Pyridinium Chloride (Calc. as C_{12}) ..... 85.0% Min.	Cationic detergent. Wetting and cleaning agent for textile fibers. As a leveling agent and color modifier in dyeing.
Monochlorbenzene C_6H_5Cl; 112.5	Clear, colorless liquid. Distillation Range..... 131.3 to 132.3°C	Dyestuff intermediate, preparation of sulfur black, brown dyes. Solvent.
Orthodichlorbenzene, Tech. $C_6H_4Cl_2$; 147	Clear, colorless liquid. Freezing Point..... −10° to −22°C Boiling Range..... 6° including 179°C	Manufacture of pyrocatechin, dye intermediates, other synthetic organic chemicals. Degreasing wool.
Phosgene (Carbonyl Chloride) $COCl_2$; 98.9	Colorless gas at ordinary temperatures. Does not discolor a 0.2% solution of KI when vigorously bubbled through it for one half hour. (Test for free chlorine)	Dye intermediate; chlorinating agent.
Sodium Sulfhydrate NaSH; 56.1	NaSH.....70 to 72% Na_2S ... 0.25 to 2.5% Fe.....5 ppm Max. NaCl ... 0.4 to 0.8% Na_2SO_3, $NaHCO_3$ ..... 0.04 to 0.4% Cu, Ni, Cr, Mn, Pb.....1 ppm Max. Water of crystallization..... 28 to 26%	Desulfurizing rayon; calico printing; in sulfur dye baths.
Sodium Sulfide Na_2S; 78.1	Na_2S..... 60 to 62% Fe..... 8 ppm Max. NaCl..... 1.5% Max. Other Na Salts..... 2.0% Max. Cu, Ni, Cr, Mn, Pb..... 1 ppm Max. Water of crystallization..... 36.5 to 34.5%	Desulfurizing rayon; calico printing; in sulfur dye baths.

HOOKER ELECTROCHEMICAL COMPANY

HOOKER CHEMICALS

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Caustic Soda **Chlorine** **Muriatic Acid** **Paradichlorbenzene** 2424

AMANTHRENE* VAT COLORS
provide the answer to the demand for
better color fastness in textiles

YELLOW A2G

In double paste and
double powder form

A gay and full-toned yellow — particularly suited for printing on cotton and rayon where light, wash and chlorine fastness, as well as ease of production, are important factors.

May be dyed by the cold or warm vat methods, either as a self shade or in combination. Stock vatting is recommended.

Another of the Amanthrene range of superior vat colors. For detailed information on the whole range available, as well as data regarding your own particular requirements, consult our nearest branch. A.A.P. technicians are always happy to be of service.

AMERICAN ANILINE PRODUCTS, INC., 50 Union Square, New York, N. Y. • ***Plant:*** Lock Haven, Pa.
Branches: Boston, Mass. • Providence, R. I. • Philadelphia, Pa. • Charlotte, N. C. • Chicago, Ill. • Los Angeles, Cal.
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*Reg. U. S. Pat. Off.

Savings UP with NOPCO* FUA

The self-fulling, self-scouring wool oil whose remarkable versatility is proven daily in countless woolen mills, on all woolen processes.

IN THE CARDING PROCESS

. . . NOPCO FUA cuts down fly . . . won't gum or load the cards. It makes possible longer runs before stripping. It helps preserve natural life and cushion of the leather rub roll aprons, giving you a loftier, rounder roving. NOPCO FUA is non-corrosive. In short —NOPCO FUA makes possible extensive savings in time and equipment.

IN THE SPINNING PROCESS

. . . Here again, NOPCO FUA reduces ultimate costs. It is non-oxidizable. It does not become set in the yarn during steaming nor in the grey goods after steaming and crabbing, to cause cloudy, shady piece dyeings. NOPCO FUA performs equally well on mules or frames.

IN THE DYEING PROCESS

. . . On piece dyes, the minute residuum of NOPCO FUA (0.2% or less) is an actual aid to level dyeing. NOPCO FUA is a leveling agent in its own right.

IN THE FULLING AND SCOURING PROCESSES

. . . NOPCO FUA achieves remarkable results when used alone. No soaps or detergents are required. (Small amounts of a polyphosphate solution added to the soda ash solution enhance sudsing.) Goods slide better in the fulling mill . . . tangles or knock-offs are prevented. Further, NOPCO FUA produces quick, uniform shrinkage and reduced rinsing time.

NOTE THESE FURTHER ADVANTAGES OF NOPCO FUA

NOPCO FUA performs like an oil on the fibers during carding and spinning and like a soap in wet finishing. It is all fatty . . . contains no mineral oil or hydrocarbons. It is salt and ash free. NOPCO FUA needs no added equipment or change in procedure.

All in all, no other wool oil can lay claim to so many exclusive advantages as NOPCO FUA. No other can duplicate its versatile performance.

Send for Technical Bulletin T-23. It describes NOPCO FUA's aid to better, faster, more economical woolen processing.

NOPCO CHEMICAL COMPANY, Harrison, N. J.

Formerly National Oil Products Company

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NOPCO TRADEMARK EVOLVED THRU RESEARCH

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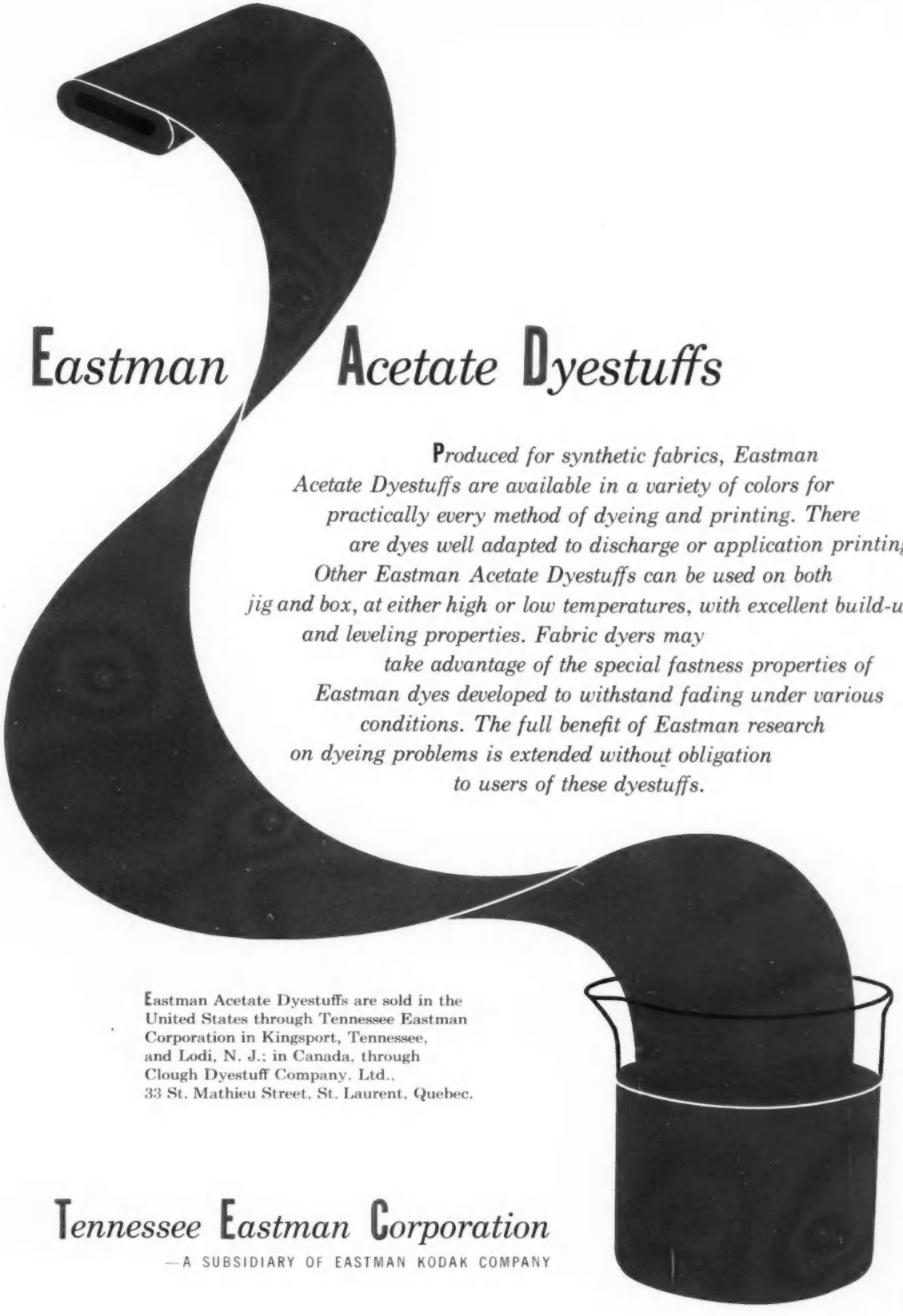
NOPCO FUA

Self-Fulling Self-Scouring Wool Oil



Eastman Acetate Dyestuffs

Produced for synthetic fabrics, Eastman Acetate Dyestuffs are available in a variety of colors for practically every method of dyeing and printing. There are dyes well adapted to discharge or application printing. Other Eastman Acetate Dyestuffs can be used on both jig and box, at either high or low temperatures, with excellent build-up and leveling properties. Fabric dyers may take advantage of the special fastness properties of Eastman dyes developed to withstand fading under various conditions. The full benefit of Eastman research on dyeing problems is extended without obligation to users of these dyestuffs.

Eastman Acetate Dyestuffs are sold in the United States through Tennessee Eastman Corporation in Kingsport, Tennessee, and Lodi, N. J.; in Canada, through Clough Dyestuff Company, Ltd., 33 St. Mathieu Street, St. Laurent, Quebec.

Tennessee Eastman Corporation

—A SUBSIDIARY OF EASTMAN KODAK COMPANY

NYANZA

ANILINE & ALIZARINE COLORS

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TEXTILE CHEMICALS

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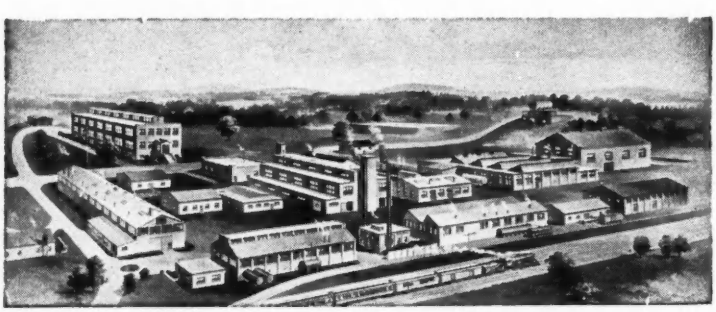
FINISHING MATERIALS

FOR

WOOL—COTTON—RAYON—ACETATE
AND MIXED FIBERS



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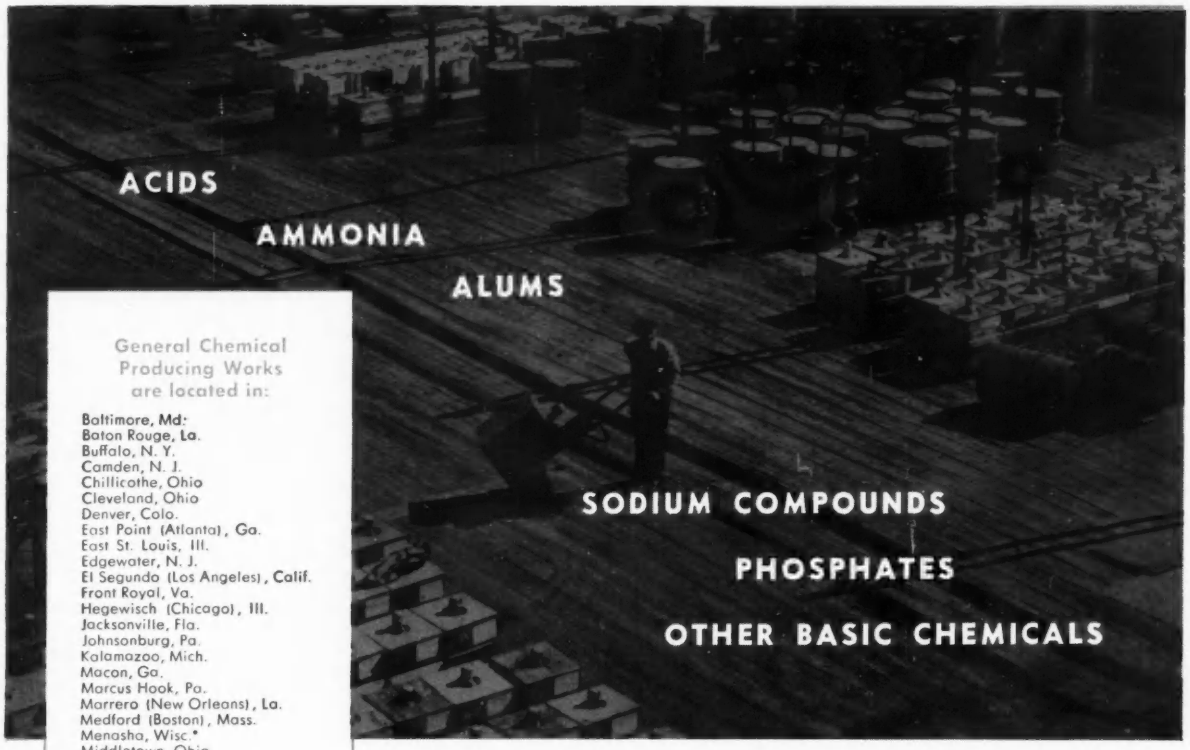
Charles Albert Smith Limited, 123 Liberty St., Toronto, Canada



General Chemical Producing Works are located in:

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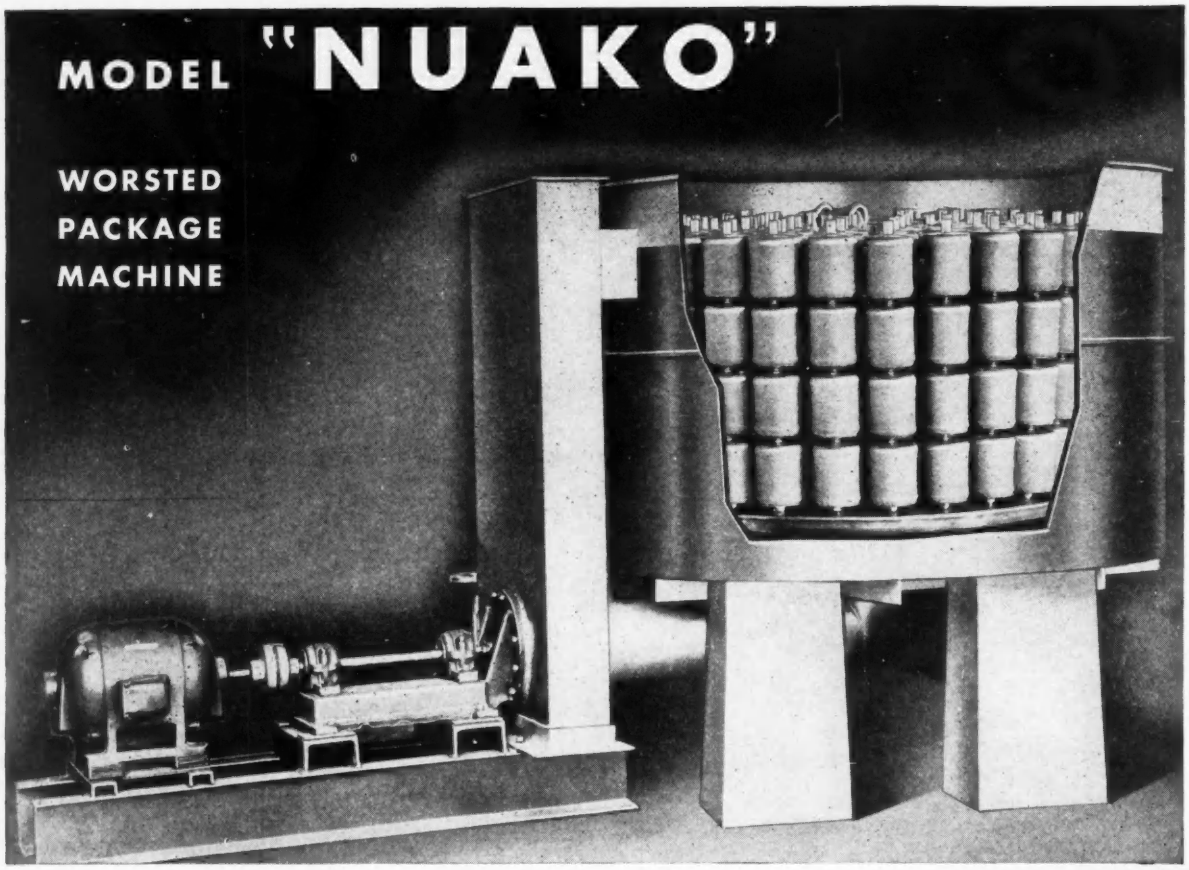

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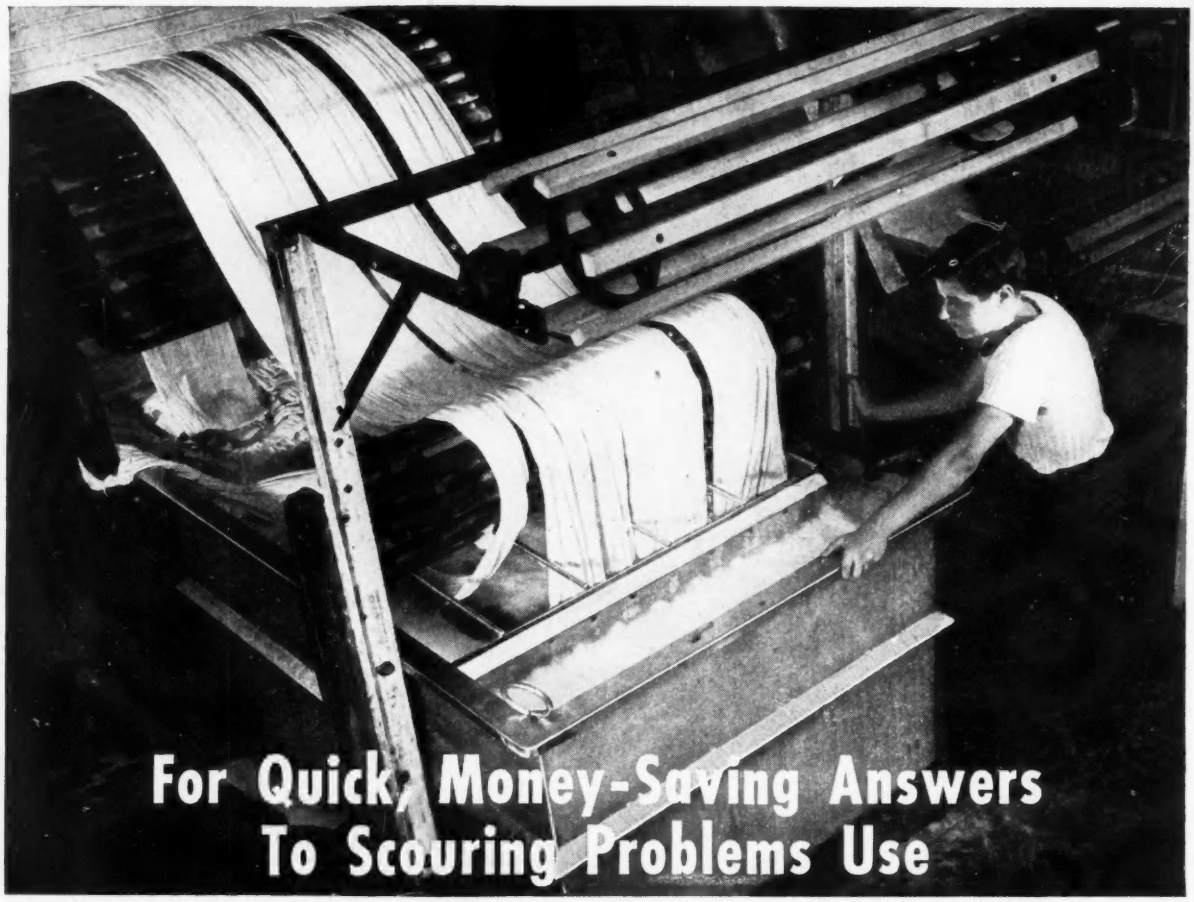

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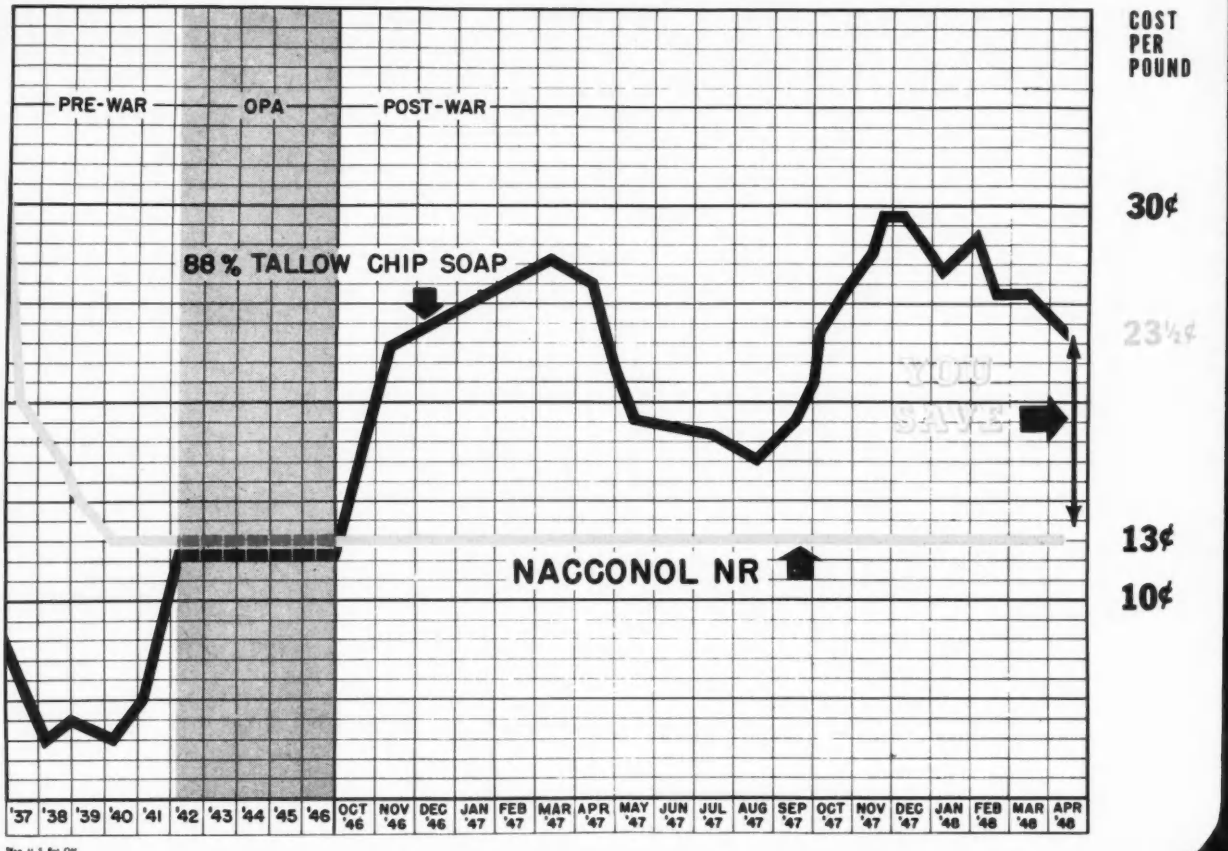
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May 3, 1948

VOLUME 37 NUMBER 9

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VOLUME 37 MAY 3, 1948 NUMBER 9

Textiles from Seaweed

WILLIAM H. CADY

EVER since Count Chardonnet made history in 1885 by exhibiting at the Paris Exposition an "artificial silk" (the later well-known "Chardonnet" rayon, made from nitrocellulose, which was the first practical "man-made" fiber), there has been a continuous search for other materials which could be similarly converted into fibers. One after the other, "Cuprammonium," "Viscose" and "Acetate" rayons, all derived from cellulose; "Aralac" (from skim-milk), "Nylon" (from adipic acid and hexamethylenediamine) and "Vinyon" (from vinyl compounds) have been produced and used commercially; still other fibers, made from peanuts, corn, soybeans and even chicken feathers, to name only a few, are coming along rapidly.

It is not the purpose of this paper to discuss any of these fibers, which have already received much publicity, but rather to call attention to one of the strangest fibers yet to be produced, and which is not so well known in this country, namely, calcium alginate, made from seaweed. It is unique in that it is soluble in alkalies, thereby (as we shall see) lending itself to an entirely new technique in fabric manufacture.

Seaweed[1] grows in great quantities off the coasts of Scotland and Ireland. Immense fields are also found off the Pacific coast; the U. S. Department of Agriculture[2] estimated in 1915 that this source of supply could yield 60 million tons of kelp per annum (Tseng[3] states "this estimate is undoubtedly much too high"). There are several types of weed, which contain varying amounts of alginic acid (the important ingredient for fiber-making) running from 15 to 40 per cent[4].

The earliest investigator of seaweed seems to have been E. C. C. Stanford[6,7], who in 1883 discovered that certain marine algae had a high content of a very viscous material which could be extracted by sodium carbonate and precipitated by mineral acids, and which formed metallic salts. He named it "algin", but it was later re-named alginic acid.

Although it is only in recent years that alginate fibers have become a commercial possibility, it may be noted that alginic acid for a long time has found uses as a thickening agent in various industries[3,5]; e.g. for warp sizing, printing pastes, and textile and paper finishes; as a stabilizing agent in ice cream, cosmetics, etc.; and for waterproofing purposes, combined with copper or aluminum.

There has been much controversy as to the exact chemical structure of alginic acid[3], but it is probable that it is a polymer of d-mannuronic acid and has a pyranose structure[8] with the formula $(C_6H_8O_6)_n$. This is confirmed by Astbury[9] who states that X-ray analysis favors the pyranose formula. The molecular weight is high, running all the way from 48,000 to 185,000[3,10]. This fact, together with the presence of reactive side-chains, and the abundance and cheapness of the raw material, makes it a desirable product for fiber-making[10].

Attempts to convert alginates into fibers possibly originated in Germany, where Sarason[11] patented in 1912 a process for spinning "aqueous solutions of alkali alginates" into solutions of neutral or acid sulfates, and stated that the filaments could be used for the production of "artificial silk, horsehair, etc." Possibly World War I prevented the further development of this process, which seems not to have been heard from thereafter.

In 1934, Godha[12] took out a patent on a process for dissolving in cuprammonium "a jelly-like substance containing algin, mannite, protein and crude cellulose matter prepared from seaweed" and spinning it into a bath containing "furfurol salt (from furfurol and caustic soda)", sodium sulfate, acetic acid, alcohol and formaldehyde, and treating the filaments with zinc sulfate. A second patent in the same year made slight changes. According to the patentee the fibers could be made similar to either silk or wool by the use of somewhat different auxiliary agents in the spinning solution. Godha claimed good dyeing qualities and high tensile strength for his fibers. No attempt was made to separate the alginic acid from the other substances in the seaweed. These fibers were not a commercial success, due to the complexity of the spinning process, the variable composition of the fibers, and the inferiority of the resultant yarns[3,10].

During the next decade several methods for making alginate films were announced. Bonniksen[13] published in 1938 a process for producing films of sodium alginate by extruding a viscous solution through a slit into a bath of calcium chloride. Takahasi[14] in 1939 cast thin films of sodium alginate on a glass plate and measured their properties. He found that the resistance to water was much improved by aluminum sulfate. Transparent alginic acid films were produced in 1943 by Cefoil Ltd.[15] by first forming the calcium alginate and further converting it into alginic acid by treatment in an acid bath.

The first important progress in the production of alginate fibers was made

by Professor J. B. Speakman, of Leeds University, England, and his associates N. H. Chamberlain and A. Johnson, whose researches resulted in the development of practical methods for spinning these fibers successfully. They have also found many new uses for them. Much of the information in this paper has been obtained from their several excellent publications[1,10,16,17,18].

Spinning of the Fibers

To make the spinning solution, seaweed is first treated with sodium carbonate which disintegrates the plant, forming a thick, gelatinous mass. This is filtered, bleached with sodium hypochlorite and acidified with hydrochloric acid, to precipitate the alginic acid. The precipitate is washed and neutralized with sodium carbonate, forming a solution of sodium alginate. This solution, when brought to the proper degree of viscosity, is forced through a spinneret into a dilute solution of sulfuric acid saturated with sodium sulfate, or a solution of calcium chloride in weak hydrochloric acid; the former solution regenerates insoluble alginic acid, while the latter produces insoluble calcium alginate. Since the latter is much more stable during storage than alginic acid, and spins better, it is anticipated that the alginic acid method of spinning will not be used commercially. When the alginic acid fiber is desired for a particular purpose it is easily obtained from the calcium salt by treatment with dilute hydrochloric acid.

The spinning method just mentioned was not entirely satisfactory because the filaments were highly swollen and tended to adhere to one another, and the handle was harsh. An improvement was made by adding olive oil to the coagulating bath, together with a synthetic detergent (Lissapol C) when spinning into calcium chloride solution, or a cationic agent (Fixanol) when spinning into sulfuric acid.[19] While these processes have been subject to further minor modifications[20,21,22] (e.g. elimination of the olive oil), they have not been changed in principle. The harshness of the fiber was greatly improved by increasing the viscosity of the spinning solution; eight to nine per cent of the dry alginate was found most satisfactory.[1,10]

The outstanding properties of the calcium alginate fiber include the following: 1. High hygroscopicity (much greater than other textile fibers); 2. Non-flammability, due to the high metallic content; 3. Moderate tensile strength, diminishing at high humidities; 4. Complete solubility in alkalies. This last property naturally makes this fiber entirely unsuitable for ordinary tensile purposes, as it would dissolve as soon as the fabric containing it was soaped. However, there are ways to improve the resistance to alkalies; and furthermore, this very solubility, instead of being a handicap, can be put to definite commercial uses, as we shall see.

To make the calcium alginate yarns alkali-resistant, so as to withstand an ordinary washing operation, they may be converted into either chromium[24] or beryllium[25] alginate[1,10]. Fibers so treated will withstand soap and soda at 40° C. with little loss in strength, and their tenacity is considerably better than that of the calcium salt, particularly when wet[1]. The chromium salt is highly colored, unfortunately, and therefore suitable only for heavy shades. Beryllium alginate does not have this defect, and also has the better tensile strength, which does not lessen on storage. It appears to be the best choice to date, where alkali-resistance is called for. Since its extensibility is too low to permit of its use in weaving[10], it is expected that the calcium salt, which has a much higher extensibility, will be employed through these manufacturing stages, and later converted first into alginic acid by means of dilute hydrochloric acid and then into beryllium alginate by treatment with basic beryllium acetate[6]. Other metals have also been tried (aluminum, zinc and iron)[10] to improve the alkali-resistance, but the results were less satisfactory.

Alginic acid yarns can also be made alkali-resistant by other treatments: 1. Impregnation with urea-formaldehyde, followed by drying at 100° C.[26] This process increases the weight of the yarn about 20 per cent and is said to make it resistant to an ordinary soap and soda scour. 2. A treatment with diisocyanates[1]. 3. A passage through a solution of formaldehyde and ammonium chloride at a pH of 3, followed by drying at 95° C.[27] Although yarn so treated is not dissolved by alkaline soap, it does become swollen.

The wet breaking strength and resistance to swelling of calcium alginate is said to be improved by steeping in gelatine and hardening with formaldehyde[28].

It may be too early to predict which, if any, of these various treatments will be found satisfactory from a practical standpoint. Also there is some doubt whether the alkali-resistant fibers will find extensive use in textiles, since they possess no special advantages over the other man-made fibers, with the one exception of their remarkable non-flammability[5], which might be utilized to advantage in curtains. The draping qualities are said to be very good. Dyeing problems, however, may constitute a drawback.

Incidentally, it is reported[29] that the British Ministry of Supply has conducted a research on alginate fibers, and has developed a fabric as strong as jute and in some respects better. Details regarding this development are lacking.

Regarding the dyeing properties of the alginate fibers the information so far published is somewhat fragmentary. Obviously only the alkali-resistant alginates need be considered here.

Wilcock[30] states that beryllium and chromium alginates have little affinity for many of the direct dyes when applied in the usual manner, but that if the yarn is first mordanted with two per cent of Fibrofix, heavy shades can be obtained; the acid dyes, with the exception of those which dye wool neutral, have little affinity, also the Neolan dyes and the dispersed acetate dyes; on the other hand, chrome mordant, afterchromed and metachrome dyes have in general a good affinity. It is also stated[23] that the affinity of the alginate fibers for direct, acid and mordant dyes is increased by a pre-treatment with a combination of formaldehyde and cyanamide; addition of a copper salt is said to improve the light fastness. Alginate fibers are also reported to have a marked affinity for basic dyes.[4].

Disappearing Fibers

The solubility of calcium alginate fibers in alkalies can be utilized in a number of ways. For many years it has been customary to make use of the fact that certain fibers are more resistant to chemical action than others, in order to obtain special effects in fabrics by weaving two different fibers together and subsequently removing one of them completely. Chaux[31] patented in 1883 a process in which yarns were made from mixtures of cotton and wool, and after weaving, the fabric was carbonized, by which the cotton was eliminated. He claimed that in this way it was possible to produce all-wool fabrics composed of yarn of lower count than could have been spun from wool alone.

Johnson[18] states that this principle was used some years ago to make fabrics containing twistless mohair in the warp, by wrapping the mohair yarn with a thin cotton thread, to support it during weaving, and later removing the cotton by carbonization.

After acetate rayon came into use, this fiber was substituted for cotton wherever a "disappearing fiber" was desired, since it could be readily removed from the fabric by treatment with acetone. In this way a variety of novel effects has been made possible.

Both the carbonization and the acetone methods require extra operations, and the latter one involves the use of large quantities of organic solvent which increase

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The Precipitation of Basic Dyes with Modified Hydrous Zirconia

WARREN B. BLUMENTHAL
The Titanium Alloy Manufacturing Company

Summary

Hydrous zirconia is treated with various anions which combine with it to form electronegatively charged zirconeate micelles. These micelles are found to precipitate basic dyes, forming insoluble complex substances. On properly preparing these precipitates, new pigments of useful properties are obtained.

Introduction

It has been shown by Thomas and Owens that certain anions convert zirconium cationic micelles to zirconeate anionic micelles.* This phenomenon has important applications in the technology of pigments, where the anionic micelles have proven effective precipitants for basic dye cations, as will be shown below.

The basic dyes have served for many years as important coloring principles in the preparation of pigments, and have particularly lent themselves to the preparation of pigments for printing inks and cosmetics. In current practice solutions of the dye are precipitated with a suitable acid, usually phospho-tungstic or phosphomolybdic acid, or a mixture of the two, or some form of tannic acid, such as quebracho extract. These precipitations yield excellent pigments, but due to the high cost of phosphotungestic-molybdic acid in the one case and the poor fastness to light of pigments made with tannic acid in the other, substitutes for both of these precipitants have been sought. A few substitutes, such as silicic acid and aluminum benzoate, have been proven useful for some very limited applications.

The application of zirconeates as precipitants for basic dyes depends on the electronegative charge on the micelles and their interaction with the colored electropositive ions in aqueous solutions of the basic dyes. The chemistry involved may be represented schematically as follows:

Hydrous zirconia is prepared by addition of ammonium hydroxide to an aqueous solution of a zirconium salt:

$$\text{I. } ZrOCl_2 + 2\ NH_4OH + (n\text{-}1)H_2O \rightarrow ZrO_2.nH_2O + NH_4Cl$$

The formula $ZrO_2.nH_2O$ is a simplified and idealized representation of a large and complex micelle,** but it serves adequately to illustrate the sequence of reactions of present interest.

The hydrous zirconia is treated with a salt or acid of an anion capable of converting it to a zirconeate:

$$\text{II. } ZrO_2.nH_2O + yNaX \rightleftharpoons [ZrO_2.(x\text{-}y)H_2O.yX]^{-y} + yNa^+ + y\ H_2O$$

In this reaction coordinated water molecules are displaced by the anion X^-, and an electronegative charge is imparted to the entire micelle, which is then designated by the term "zirconeate".

The basic dyes are complex organic salts of the form DHCl where D is a dye base and HCl is coordinated acid. In a solution of such a dye ionization occurs:

$$\text{III. } DHCl \rightleftharpoons DH^+ + Cl^-$$

When the dye solution is added to a zirconeate slurry, precipitation occurs:

$$\text{IV. } yDH^+ + [ZrO_2.(x\text{-}y)H_2O.yX]^{-y} \rightarrow (DH)_yZrO_2.(x\text{-}y)H_2O.yX$$

The product $(DH)_y\ ZrO_2.(x\text{-}y)\ H_2O.yX$ may be given the generic name "dye anionato-zirconeate" and a specific example is methyl violet citrato-zirconeate.

Experimental

A. Preparation of Various Methyl Violet Anionato-Zirconeates

Hydrous zirconia was prepared by adding 1:1 ammonium hydroxide slowly to a solution containing 100 gm. $ZrOCl_2.8H_2O$† per liter, until a pH of 7.0 ± 0.1 persisted for at least ten minutes. Throughout this and subsequent steps the temperature was maintained at 25° C. ± 1°, and pH was controlled with a Beckman pH meter. The slurry was stirred briefly, then filtered and the precipitate washed until the effluent water contained mere traces of chloride ion. The filter cake was then redispersed in water by grinding in a pebble mill. The volume of the dispersion was finally adjusted to contain a concentration of 3.5 grams suspended ZrO_2 per 100 ml.

Mixtures were prepared of the hydrous zirconia slurry and 5% aqueous solutions of Methyl Violet. To these mixtures various anions were added as aqueous solutions of acids or salts, and the pH was finally adjusted to 5.0, using NaOH or HCl.

After stirring five minutes the slurry was filtered and the total unprecipitated dye in the filtrate estimated by comparing its color intensity with those of dye solutions of known strengths.

Table I shows the extents to which the dye was precipitated by various anions in combination with hydrous zirconia.

B. Preparation of a Methyl Violet Salicylato-Zirconeate Pigment

27.5 gm. $ZrOCl_2.8H_2O$ was dissolved in water and the solution adjusted to 150 ml. at 25° C. While stirring vigorously, 1:1 ammonium hydroxide was added slowly until a pH of 7.0 ± 0.1 persisted at least ten minutes. The slurry was filtered and the precipitate washed until the effluent water contained mere traces of chloride. The filter cake was redispersed in water and the volume of the dispersion adjusted to 300 ml. at 25° C. 32 ml. of a solution of sodium salicylate, containing 16.0 gm. salicylic acid, was added. The pH was adjusted to 5.0 and an aqueous solution

* A. W. Thomas and H. S. Owens, Journ. Amer. Chem. Soc. *57*, 2131 (1935).

** cf., A. W. Thomas and An Pang Tai, Journ. Amer. Chem. Soc. *54*, 841 (1932).

† Technical grades of chemicals and dyes were used in this work. The zirconium oxychloride was assayed and the weights used corrected according to the assay.

TABLE I

Precipitation of Methyl Violet by Hydrous Zirconia in the Presence of Various Anions

Anion	Moles anion in system per mole ZrO_2	Moles dye in system per mole ZrO_2	Percentage of dye precipitated
Benzoate	1.25	0.105	97.
Bichromate	0.197	0.105	nearly all*
Blank, no anions	0.0	0.174	trifling
Borate (tetra)	0.512	0.105	trifling
Chloride	0.169	0.174	trifling
Citrate	0.624	0.176	99.
Fluoride	0.171	0.174	trifling
Fluosilicate	0.156	0.105	trifling
Molybdate	0.969	0.105	99.9
Oleate	1.38	0.105	97.
Oxalate	0.69	0.105	67.
Phosphate	0.50	0.116	trifling
Salicylate	1.96	0.211	99.9
Silicate	0.606	0.105	trifling
Sulfate	0.86	0.174	trifling
Tannate	0.109	0.105	99.6
Tartrate	0.50	0.174	99.
Tungstate	0.356	0.105	98.

* Bichromate color in solution interfered with estimation of dye.

TABLE II

Thoroughness of Precipitation of Basic Dyes by Salicylato-Zirconeate

Dye	Lowest order of amino group contained	Thoroughness of precipitation
Crystal Violet	Tertiary	Good
Rhodamine B	Tertiary	Good
Safranine	Tertiary	Good
Victoria Green	Tertiary	Good
Auramine	Secondary	Fair
Methyl Violet	Secondary	Fair
Bismark Brown	Primary	Poor
Chrysoidine	Primary	Poor

containing 11.2 gm. Methyl Violet in 225 ml. was added at a rate of 50 ml. per minute. After stirring ten minutes the slurry was filtered and the precipitate washed with two 100 ml. portions of cold water. After drying the filter cake at 55° C., 24.8 gm. of a brilliant violet pigment was obtained.

C. Preparation of Various Zirconeate Pigments

All basic dyes examined were precipitated by zirconeate slurries, and pigments comparable in properties to that obtained with Methyl Violet were obtained from the dyes Auramine, Chrysoidine, Bismark Brown, Crystal Violet, Methylene Blue, New Blue, Rhodamine B, Rhodamine 6G, Rhoduline 6G, Safranine and Victoria Green. The same procedure was followed as in the preparation of the Methyl Violet salicylato-zirconeate, the Methyl Violet being replaced by an equal weight of the other dye. In some cases the pH was maintained at 4.0 or 3.5 during the addition of the dye to the zirconate to accomplish more complete precipitation.

The thoroughness of precipitation of the dye by salicylato-zirconate varied with different dyes, and a systematic basis for such variation is indicated by Table II.

Discussion

The experimental results show that certain anions render hydrous zirconia a precipitant for basic dyes while other anions do not. Where data is available for comparison, it is found that the effective anions correspond to those listed by Thomas and Owens as forming zirconeates, while the ineffective anions belong to the list of those not forming zirconeates.

The Methyl Violet salicylate-zirconeate pigment described in section B was a soft, clean, brilliant pigment, readily dispersed in oil to form a printing ink of high color strength. In making this pigment, 0.085 moles of zirconia, 0.0201 moles of dye and 0.116 moles of salicylic acid were used. From this proportion of reactants (salicylic acid in excess) and from the yield, the empirical composition $C_{24}H_{28}N_2 . 4ZrO_2 . C_7H_6O_3 . 14\ H_2O$, mol. wt. 1239.5 is computed. On the basis of the weight of dye used, a theoretical yield of 24.9 gm. should be obtained of this composition. The actual yield was 24.8 gm.

The similar precipitations obtained by the action of zirconeates on a considerable number of basic dyes indicate the zirconeates to be general precipitants for the entire class of basic dyes. The soft texture, brilliant shade and intense color strength of the dried precipitates afford useful properties for pigment applications.

Acknowledgment

The author is indebted to Dr. Eugene Wainer and Dr. Stephen F. Urban for encouragement and helpful suggestions throughout this development, and to Ray Siefert for valuable assistance in the experimental procedures.

Textiles from Seaweed

(Continued from Page 284)

the cost and the fire risk. By the use of calcium alginate fibers, no such solvent is required, and a simple alkaline scour removes the alginate fibers completely.[3,10]

Wacker[32] in 1940 proposed the use of fibers made of polyvinyl alcohol or certain water-soluble derivatives of cellulose, to produce the foundation fabric for embroidery manufacture; the fabric to be removed, and the embroidery freed, by subsequent washing in water. It is doubtful, however, if such water soluble substances possess the necessary qualities for successful spinning and weaving[17].

Johnson and Speakman[17,18] have given us a full description of the various special types of fabric which are either made possible or improved by taking advantage of this solubility of calcium alginate in alkalies. The alginate fiber may be used in a variety of ways, as follows:

1. As a reinforcing agent to wind around hairy or twistless yarns in order to assist them through the loom.

2. As a "core" for wool crepe yarns, which are wrapped around the alginate thread and woven in combination with straight wool yarns, producing crepe effects when the alginate thread is removed by scouring. Astrakhan effects can also be obtained similarly.

3. As a spacing agent to produce "missing threads" in both warp and filling.

4. As a supporting thread, twisted with very fine worsted yarns, and dissolved out after weaving, to produce very light weight fabrics which could not otherwise be woven (as in the Chaux process[33] previously mentioned).

If a fabric is constructed partly of alginic acid yarns and partly of cotton or other fibers, and a pattern is printed on, using a hardening substance (e.g. basic chromium acetate) to render the alginic acid alkali-resistant in the printed areas, on scouring the fabric the alginic acid in the unprinted portions will dissolve, producing fancy structural effects.[17,18]

If calcium alginate is treated with a dilute solution of sodium carbonate it softens and gelatinizes before actually dissolving. It can then be hardened and made alkali-resistant as above described, and acts as a bonding agent for the other fibers. This property can be used in cut pile fabrics to bind the pile threads to the foundation cloth, by weaving alginate yarns into the fabric[17,18].

(Concluded on Page 289)

Evaluation of Uncontrolled Gas Fading Equipment

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IN the present tentative method of the American Association of Textile Chemists and Colorists (*1*) for testing the fastness of dyes to atmospheric gases, the apparatus is specified as "any equipment in which test samples can be exposed to air which has passed through the flame of a lighted gas burner." These brief specifications fail to include provisions for control of the several variables involved in making gas fading determinations. In 1940, Seibert (*3*) showed that such factors as temperature, humidity, and rate of gas consumption affected the degree of fading of the specimens exposed in the gas chamber; and subsequent unpublished studies at The Pennsylvania State College have confirmed these findings.

The investigation described in this report has demonstrated the range of variation which may be found in such factors as temperature, humidity, gas consumption, and the age of the wire gauze employed in the equipment.

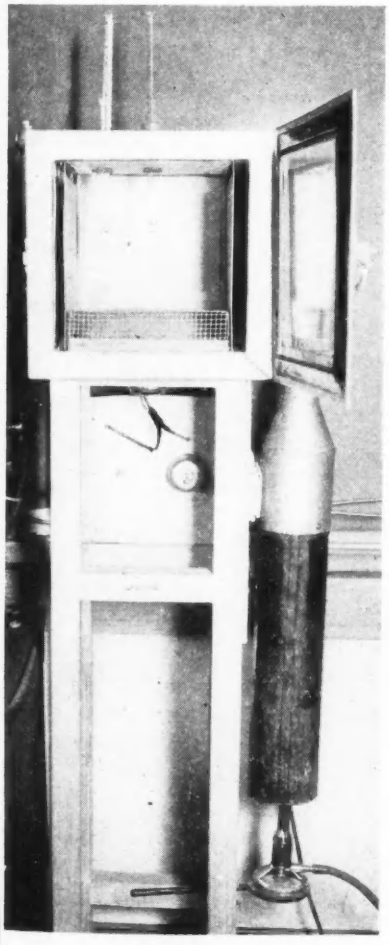

Figure 1
A Modified Gas Chamber of the American Association of Textile Chemists and Colorists

Methods of Procedure

Description of Apparatus

The gas chamber used was that of a type employed frequently at the time when the investigation was begun, for the purpose of making gas fading determinations. This equipment is shown in Figure 1. It was built according to a blueprint provided by the American Association of Textile Chemists and Colorists in connection with a tentative standard method of making atmospheric gas fading tests. It was constructed of galvanized iron, with a glass window in the door; a thermometer was inserted through a hole in the top. The gases from a lighted Number 3 type of Meker burner entered the chamber at the right side; they were deflected by baffle plates; they were kept in circulation by means of a fan driven by a small electric motor; and they were emitted from the oven through an exit pipe fitted with a reducer at the left. A 20-mesh iron gauze was placed two and one-half inches above the lower end of the inlet pipe and one inch above the grid of the burner. The function of the latter, as suggested in the specified test procedure, was to increase the quantity of destructive gases, and thus accelerate the test.

The following modifications of the blueprint plan were adopted for the purposes specified.

(a) Calibrated dry and wet bulb thermometers, and a small glass water container (provided to keep the wick moist) were inserted in a rubber stopper and fitted into an additional hole made in the top of the oven. This was used for recording humidity throughout the testing period.

(b) A Fischer and Porter calibrated rotameter, shown in Figure 2, was installed in the gas line so that the flow of gas could be controlled manually at the desired number of cubic feet per hour.

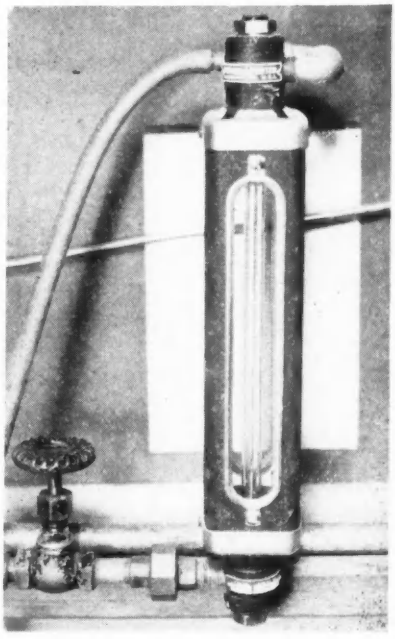

Figure 2
Fischer and Porter Rotameter, Used to Measure and Regulate Rate of Gas Consumption

* Deceased March 1, 1947.

TABLE I—RECORD OF OVEN CONDITIONS DURING EXPOSURE PERIODS
(AATCC METHOD OF TEST)

Date	Temperature °C			Humidity						Gas Consumption (Cubic Feet/ Hour)		Wire Gauze (Periods) Use	Length or Run
				Absolute*			Relative (Per Cent)						
	High	Low	Average	High	Low	Average	High	Low	Average	High	Low	of	(Hours)
12/18/45	56.0	52.5	54.7	0.052	0.051	0.051	47	39	42	X	X	1	6⅛
12/19/45	56.5	51.5	55.4	0.053	0.051	0.052	52	37	42	X	X	2	6
12/20/45	57.0	51.0	54.5	0.053	0.049	0.051	52	36	42	X	X	3	6
12/21/45	57.0	50.0	54.7	0.053	0.051	0.052	49	37	43	X	X	4	6
1/2/46	56.5	51.5	55.3	0.053	0.051	0.052	50	38	42	X	X	5	6
1/3/46	56.5	50.5	54.5	0.051	0.048	0.050	54	39	45	X	X	6	6
1/4/46	57.0	52.5	55.6	0.053	0.051	0.052	49	38	42	X	X	7	6
1/7/46	56.0	50.5	54.5	0.052	0.047	0.050	58	37	45	X	X	8	6
1/8/46	56.5	51.0	53.9	0.051	0.051	0.051	50	40	43	X	X	9	6⅛
1/21/46	55.5	50.0	54.1	0.051	0.049	0.050	54	39	44	X	X	7	6
1/22/46	57.5	51.5	55.5	0.050	0.048	0.049	46	36	40	3.2	3.2	8	5¾
1/23/46	59.0	53.0	56.6	0.050	0.048	0.049	43	35	38	X	X	1	6¾
1/24/46	58.5	51.0	54.9	0.052	0.050	0.051	57	37	44	3.2	3.2	2	6¼
1/25/46	57.0	53.0	55.6	0.052	0.050	0.050	45	37	40	3.2	3.2	3	6
1/28/46	56.0	51.0	54.4	0.053	0.051	0.052	52	39	43	3.2	3.2	4	6
1/29/46	57.0	50.5	55.5	0.053	0.051	0.052	56	37	44	3.4	3.2	5	6
1/30/46	55.5	51.5	54.1	0.053	0.049	0.051	52	38	43	X	X	6	6¼
1/31/46	56.0	49.5	54.6	0.053	0.051	0.052	62	37	46	X	X	7	5½
2/4/46	54.5	51.5	53.6	0.052	0.051	0.052	47	47	47	X	X	8	5¾
2/5/46	56.5	49.0	54.5	0.051	0.050	0.051	56	37	44	3.5	3.2	9	5¾
2/6/46	57.0	52.5	55.8	0.057	0.053	0.055	53	40	36	3.2	3.0	1	6
2/7/46	56.5	52.0	55.4	0.052	0.051	0.051	49	37	41	3.2	3.2	2	5½
2/8/46	57.5	53.5	55.8	0.054	0.051	0.052	49	37	41	3.2	3.0	3	5¾
2/11/46	56.5	51.0	54.3	0.054	0.051	0.053	53	40	45	3.4	3.2	4	5½
2/12/46	57.5	50.5	56.1	0.055	0.052	0.054	54	36	45	3.2	2.8	5	5½
2/13/46	55.0	48.5	53.1	0.057	0.054	0.056	60	47	52	3.2	3.2	6	5½
2/14/46	51.5	46.5	49.0	0.057	0.051	0.054	73	58	66	3.5	3.2	7	5½
2/20/46	58.0	52.5	56.1	0.057	0.052	0.054	48	36	40	3.5	3.0	1	5¾
2/22/46	53.5	47.0	51.0	0.052	0.051	0.052	65	45	53	3.5	3.2	8	5½
2/25/46	55.0	48.5	52.9	0.052	0.051	0.051	57	43	48	3.2	3.2	9	5½
2/27/46	57.0	51.0	55.3	0.056	0.055	0.055	53	39	44	3.2	3.2	1	3¾
2/28/46	57.5	51.5	55.1	0.057	0.050	0.054	52	36	44	3.2	3.0	2	5½
3/1/46	57.0	51.0	54.6	0.057	0.056	0.056	53	39	45	3.2	3.2	3	5½
3/4/46	58.0	52.5	55.9	0.056	0.051	0.054	49	37	41	3.4	3.0	4	5½
3/5/46	57.5	51.5	54.9	0.053	0.051	0.052	50	38	46	3.2	3.0	5	5¼
3/6/46	58.5	51.5	55.9	0.059	0.056	0.058	54	40	47	3.5	2.9	6	5
3/7/46	54.5	50.5	53.3	0.062	0.061	0.062	72	51	62	3.2	3.2	7	4
3/8/46	50.0	48.5	48.9	0.054	0.051	0.053	65	60	63	3.2	3.2	8	4⅝
3/11/46	54.5	52.0	52.8	0.052	0.048	0.050	48	43	45	3.2	3.2	9	4⅝
3/13/46	57.0	51.0	54.8	0.054	0.052	0.053	51	38	43	3.2	3.2	2	5¼
3/14/46	58.0	52.0	55.7	0.054	0.050	0.052	47	35	41	3.2	3.2	3	5¼
3/17/46	56.5	51.0	54.6	0.055	0.053	0.054	54	39	43	3.3	3.2	4	5
3/18/46	53.0	49.5	52.2	0.058	0.054	0.057	60	50	53	3.2	3.2	5	4½
3/19/46	54.5	49.0	52.8	0.056	0.051	0.053	53	40	47	3.3	3.2	6	4½
3/20/46	58.0	55.5	57.4	0.049	0.049	0.049	31	31	31	3.2	3.0	7	4¾
3/21/46	57.5	50.5	54.4	0.054	0.050	0.052	50	36	42	3.3	3.0	1	5½
3/23/46	56.0	54.5	55.4	0.051	0.050	0.051	41	39	40	3.2	3.1	2	5⅛
3/25/46	58.0	51.5	55.3	0.055	0.052	0.053	54	34	42	3.5	3.1	3	3½
3/26/46	53.5	51.0	52.7	0.058	0.054	0.057	52	49	50	3.3	3.1	4	5
3/26/46	54.5	50.5	52.7	0.058	0.055	0.057	57	51	54	3.2	3.2	5	5
3/27/46	55.0	51.0	52.6	0.054	0.051	0.053	52	40	47	3.3	3.2	6	5
3/27/46	53.0	51.0	52.3	0.056	0.053	0.055	54	52	53	3.2	3.1	7	5
4/1/46	52.0	47.5	50.8	0.059	0.053	0.056	73	54	62	3.3	3.2	8	5
4/2/46	59.5	48.0	50.6	0.059	0.050	0.054	60	58	59	3.4	3.1	9	6½
4/3/46	57.5	55.0	56.7	0.055	0.054	0.054	42	39	40	3.2	3.1	1	6¾
4/9/46	57.0	53.5	55.8	0.059	0.054	0.057	49	40	44	3.2	3.2	2	6
4/10/46	58.0	48.0	55.1	0.059	0.051	0.055	52	40	45	3.4	3.1	1	6
4/10/46	57.5	55.0	56.4	0.059	0.055	0.057	45	42	44	3.2	3.2	2	6
4/11/46	54.5	51.0	53.3	0.060	0.056	0.058	50	45	48	3.2	3.2	3	5½
4/11/46	54.0	52.0	53.4	0.061	0.058	0.059	53	51	52	3.2	3.2	4	5½
Range and Average	59.5	46.5	54.3	0.062	0.048	0.053	73	31	46	3.5 Average	2.8 3.2	X High Low Average	6¾ 3½ 5½

*Pounds water vapor per pound of dry air

(c) An additional 19-inch length of four-inch black iron stove pipe was attached to the inlet pipe to permit placing the burner farther from the oven, thus allowing increased gas consumption for a given oven temperature. This method of acceleration has been used by other investigators.

Variables Studied

The following variables were recorded periodically throughout each testing period, but were controlled only to the extent indicated:

(a) *Temperature.* The temperature varied both with the room temperature and with the gas consumption; but it was kept below 60° C. (140° F.) by manual methods, and the exact temperature was recorded periodically throughout the study.

(b) *Humidity.* Both the absolute and relative humidity values were calibrated from dry and wet bulb readings recorded at hourly intervals during the testing period.

(c) *Rate of Gas Flow.* By manual control and by the use of the rotameter described in a previous paragraph, an attempt was made to keep the gas consumption at 3.2 ± 0.2 cubic feet per hour.

(d) The age of the wire gauze in periods of use was recorded as a possible variable affecting the amount of time required for the test.

(e) The length of each test period (with the use of the tentative procedure of the American Association of Textile Chemists and Colorists) was determined by means of a control strip dyed in accordance with the procedure specified in the 1945 Yearbook of the AATCC *(5)*. When the control strip appeared to have reached the amount of color change represented by the Standard of Fading (supplied by the AATCC), a confirmatory heat treatment was applied according to the method of Seibert *(4)*. This consisted in placing the control strip for 30 seconds under an iron heated to a temperature of 105 ± 5° C. When the test had run the required time, the control strip became as reddish as Munsell 10.0 PB between 6/8, 5/8 and 5/10, or as reddish as 5.0 P between 6/6 and 5/8, but less reddish than 5.0 P 5/10.

The rate of air, which depended on the tendency of hot air to rise, was assumed to be reasonably constant, and therefore was not recorded in this study. It was

recognized that the addition of 19 inches to the standard length of the inlet pipe would change the rate of flow; this change was consistent throughout the study.

Presentation of Data

A record both of the uncontrolled and the partially controlled oven conditions throughout the series of gas-fading tests is presented in Table I.

Discussion of Findings

A study of Table I gives the range in temperature, humidity, gas consumption, and the length of each test, with a further record of the age of the wire gauze in periods of use.

Temperature

Temperature varied considerably, ranging from 46.5° C. to 59.5° C, and averaging 54.3° C. This variation is not surprising since the room temperature fluctuated and there was no means of controlling the oven temperature other than by changing the gas consumption, which in itself presented another variable.

Humidity

The absolute humidity, or pounds of water vapor per pound of dry air, varied from 0.048 to 0.062 over the series of tests under consideration, and averaged 0.053. Percentage relative humidity was one of the most variable conditions encountered; it ranged from 31 to 73 per cent, with an average of 46 per cent.

Gas Consumption

The gas consumption, which was measured by the use of the rotameter previously described, was kept between 2.8 and 3.5 cubic feet per hour, by manual operation. Although an attempt was made to keep it between 3.2 and 3.4, it frequently fluctuated beyond these limits because of changes in gas pressure.

Quality of Gas

A further factor which undoubtedly varied, but which was not recorded throughout these tests was the composition of the gas used. In 1937 Rowe and Chamberlain (*2*) reported that, whereas the amount of oxides of nitrogen was independent of the composition of the gas burned, the sulfur dioxide content might vary considerably with the source of gas supply. In view of the fact that oxides of nitrogen accelerate the oxidation of sulfur dioxide to sulfur trioxide in the presence of water vapor, it appears that this factor may have affected the length of the tests.

Age of Wire Gauze

Each wire gauze was used for a total of nine test periods before it was discarded. It was noted that, in most cases, the time required for the test became less the longer the gauze had been used. This could affect both the quality and the quantity of destructive gases.

Times Required for One Test Period

The wide variation in the length of the test periods (3½ to 6¾ hours) illustrates the need for closer control of the variables.

Summary

Wide variation was found in the time required for one gas-fading test period (AATCC method) in a series of tests with the use of one of the current types of equipment. Possible causes were accompanying fluctuations in temperature, humidity, gas consumption (only partially controlled), and quality of gas. Even the age of the wire gauze in periods of use appeared to influence the length of the test.

Although the extent to which each of the above variables individually affected the length of the test is not apparent from the data here presented because no means were provided in this apparatus for holding all but one variable constant at a time, the desirability of controllable equipment for gas-fading observations is indicated strongly.

Acknowledgment

This study was conducted under a research fellowship maintained by the American Viscose Corporation at the Ellen H. Richards Institute, The Pennsylvania State College.

This is the second in a series of reports on methodology studies related to gas fading, from the laboratories of the Ellen H. Richards Institute, sponsored by the American Viscose Corporation.

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Textiles from Seaweed

(Continued from Page 286)

Reference has been made to the use of fabrics made of water-soluble yarns in embroidery manufacture. Here also a calcium alginate fabric seems well adapted as a basis on which the stitches of an interlocking embroidery pattern are superimposed. On dissolving out the alginate, a net-like effect similar to lace is produced[18].

Calcium alginate yarns might be suitable for making cloth for parachutes employed to drop mines in enemy waters, and which must be soluble in sea water. Fabrics made from cellulose methyl esters were used for this purpose in the late war[33].

Several excellent tables showing the physical properties of the alginates have appeared in the various journals[1,10,34,35].

While it is too early to predict the place which the alginate fibers will eventually occupy in the textile industry, it seems certain that they will find a number of important uses. Owing to the limitations of space it has been impossible to give in this paper full details regarding the applications of these interesting fibers; for further information the reader is referred to the following publications.

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• PATENT DIGEST •

PAUL WENGRAF

Resin Condensates, Improving the Fastness of Dyeings
C, 4, 01

U. S. Pat. 2,431,562
(Ciba Company, Inc., Jacoby, Nov. 25, 1947)

Aminotriazine (melamine) aldehyde resins are frequently used for treating textiles in order to increase the fastness of dyes, also to prevent the fabrics from shrinking. These resins have quite generally no affinity whatsoever to the fabrics, neither in the dissolved nor in the dispersed state. The purpose of the present invention is to find a simple and economical method for the fiber treatment so that the solution might be exhausted quite in the same way as a dyestuff solution. This effect can be attainead by treating melamine- formaldehyde resins *in the water-soluble stage* (thus as a pre-condensate) with a strong mineral acid in the cold and allowing the mixture to stand for some time. It can be concluded that a reaction takes place because the textiles will absorb a greater amount of resin substance when treated by this method while, at the end of the treatment, the fiber material has absorbed completely the resin solution. The resin solution has to be prepared in the following way: 100 cc. of water are heated to 110° F. and 10 cc. HCl 20° Bé are added. 22 g. of melamine-formaldehyde pre-condensate (melamine just dissolved in formaldehyde on the steam bath and immediately cooled thereupon) are added to this acid solution while stirring. After 24-48 hours a change takes place. The chemical process occurring in this reaction is not yet precisely known but it could be proved that the freshly prepared solutions have an inferior effect compared with that of the solutions used after a longer storage.

References cited by the Patent Office are amongst others:

U. S. Pat. 2,322,333 (Ciba): melamine-formaldehyde (or urea-formaldehyde, thiourea-formaldehyde, etc.) resin condensates for increasing the fastness of dyeings and prints.

U. S. Pat. 2,345,543 and 2,356,719 (Am. Cyanamid): positively charged colloidal melamine-formaldehyde condensates are used as resin forming agents for fixing dyestuffs, also for treatment of paper or cloth, the second patent referring particularly to cation-active solutions from guanamine and formaldehyde.

Other references:

Brit. P. 588,990 (Geigy): describes an aftertreatment of dyeings with dicyandiamide-formaldehyde condensates which have further been reacted with ammonium chloride; a non hygroscopic, water soluble powder results.

Brit. P. 576,562 (same company): protects an after-treatment with dicyandiamide-formaldehyde condensates, made water-soluble with glacial acetic acid.

Permanent Coatings, Prepared from Protein, Polyphosphates
G, 2, 01

U. S. Pat. 2,431,119
(Hall Laboratories, Horvath, Nov. 18, 1947)

The invention deals with solutions and coatings made by dissolving a protein-polyphosphate compound. These compounds are prepared according to a copending application by extracting cotton seed meal or a similar proteinaceous material with a dilute solution of *sodium phosphate glass* (molar ratio at a pH 5-9: $Na_2O : P_2O_5 = 1.1 : 1$ up to $1.4 : 1$). The solution, containing the proteins is acidified and separated by filtration. There are several ways for dissolving the protein polyphosphate compound but the most important consiasts of dispersing the composition in urea. These dispersions form protective coatings on different objects.

References cited by the Patent Office are amongst others:

U. S. Pat. 2,322,656 (Cole): describes the use of a composition from urea and casein for treating poison ivy.

U. S. Pat. 2,241,868 (Hall Labor.): adding pyrophosphate to blood for preventing coagulation of fibrous substances.

U. S. Pat. 2,215,137 (Hall Labor.): alkaline casein dope extruded in metaphosphoric acid solution.

U. S. Pat. 2,204,535 (Gould-Whittier): referring to protein fibers to which fatty acids such as oleic acid have been added.

Other References are:

U. S. Pat. 2,262,770-71 (Stein-Hall): urea dispersions of caseins are used as permanent finishes when mixed with amines or ammonium bases.

U. S. Pat. 2,293,385 (Borden Company): rennet precipitated casein is transformed into a water clear solution useful for sizing and finishing, by a treatment with sodium pyrophosphate.

Algin-Protein as a Sizing Composition
A, 4, 01

U. S. Pat. 2,430,180
(Algin Corporation of America, Le Gloache, Nov. 4, 1947)

It has been discovered that Algin can react with proteins under certain specific conditions, which may be characterized as follows: algin, i.e. the complex organic substance, obtained by the extraction of seaweed is often erroneously termed as "alginic acid". The inventor prefers to call it "algin" because it has not the pure acid characteristics; it behaves as a colloid insoluble below its iso-electric point (between 2 and 3) but soluble above this point. Proteins have different isoelectric points (gelatine 5.2-5.4, casein 4.7 and so on). It has been found that algin and proteins are able to react to give new compounds provided that the reaction is carried out at a pH, situated between these two iso-electric points of the components. The complex compound resulting from this reaction is termed as "algino-protein". It has furthermore the property of reacting with cellulose ethers to form new and obviously not quite clearly defined complexes. These products are used as sizing or dressing agents also as stabilizing products for emulsions and the like.

References: British P. 575,611 (Cefoil): describes a combination of algin with urea-formaldehyde pre-condensates in the presence of primary sodium phosphate in order to stabilize algin solutions for filaments and the like.

Vat Dyeing, Developing in Air-Bubbles Containing Soap Bath
C, 4, 02

French Patent 922,082
(Etabl. Schaeffer, Kormann, May 28, 1947).

This patent relates to a treatment of textiles in foaming baths, for instance in liquids containing soaps or other detergents. It is known to proceed in such treatments by blowing air through the solutions. According to the present method a more energetic effect is said to be attained by inserting *porous materials* into the bath, for instance porous plates of porcellaine or the like, and pressing air through the small holes of these plates whereby minute air bubbles filling the bath and increasing the lather are produced. Another form in which the porous

(Continued on Page 317)

Proceedings of the
American Association of Textile Chemists and Colorists

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Members should notify the Secretary immediately of all address changes

Research Committee Meeting

Hotel Pennsylvania, New York, April 2, 1948

A MEETING of the Research Committee was held on April 2, 1948 at the Hotel Pennsylvania in New York with Chairman J. Robert Bonnar presiding. The well attended meeting produced many reports of interest.

Chlorine Retention

A. W. Etchells, Chairman of the new Committee on Chlorine Retention, reported that organization plans have been completed and that this committee will study first, the Suter test, as it is felt that this is more useful than the chemical test. The primary interest is in the amount of damage to the fabric by the chlorine retained in the fabric. Experimental work will cover various percentages of chlorine on rayon fabrics both with and without the use of anti-chlor, and with and without the presence of resin.

Snag Resistance

Dr. J. E. Smith, Chairman of the new Committee on Snag Resistance, reported the completion of organization, and that in the main the work of this committee will concern itself with three matters: (1) Evaluation of methods of measuring snag resistance; (2) Factors contributing to snagging; 3) Methods of overcoming snagging in the industry. Dr. Smith then explained the correlation of his committee with the activities of Committee A-12 of ASTM pointing out that several members of his committee are also members of the ASTM Committee. Since ASTM already has a program on the evaluation of snag resistance in connection with the American Standards Association, and has already started work studying the sandpaper type tester recently described in the literature, the evaluation of currently existing test methods and equipment will be the province of ASTM. The AATCC committee will undertake a study relating directly to snag control, matters of flexibility and stiffness of fabric, adhesive properties of fabric and finish, film properties, static electricity, hygroscopicity, etc., using the ASTM snag resistance test.

Executive Committee on Research

Mr. Bonnar, who is also Chairman of the Executive Committee on Research, gave a resume of the activity of that group. As a result of a research problem screening meeting several very worthwhile thoughts and problems have been obtained. Two local sections of the Society have already been assigned research problems and three other sections are planning to decide on their work so that within a relatively short time eight to ten committees in several of the sections will be working on new research problems. He further discussed cooperation between AATCC and ASTM since a line of demarcation between their activities is necessarily difficult to draw at times. It is, however, important that there be no unnecessary duplication, so that plans have been worked out involving cross-membership of committees with reports to both Societies. The AATCC is also cooperating with the Textile Research Institute on a practical basis to assist them in their recently announced research project on the fundamentals of dyeing. He further reported that test methods have been assembled for a cooperative program with the Society of Dyers and Colourists in England for inclusion in the proposed revision of the Colour Index. They have now been submitted to the various committees for final decision on their transmission to the cooperating English society.

Research Group

Dr. H. W. Stiegler, Director of Research, reported on the activities of the research group at Lowell Textile Institute. Work on the O.D. No. 7 Quartermaster project has been finished and a final report is being drafted. He stated that along with the development of a large machine for measuring dimensional restorability, a small machine is being worked on which should be more convenient to operate. It is not known now whether the small machine will be accurate or give the information desired. With reference to wash fastness the work at Lowell has been primarily to develop a method or instrument to evaluate the effect on the cloth of laundering by commercial laundries. At the present time the work is progressing along two lines: (1) To determine if the Launder-Ometer can be used to develop an accelerated test. (2) To develop a still more rapid test with a small instrument different from the Launder-Ometer. Progress in this direction is very encouraging. In connection with the attempts at Lowell to develop a detergency machine, Dr. Stiegler reported that recent changes on this machine are worthwhile, and it is believed that the delay caused by these changes will provide important information. A new machine is now being designed incorporating these changes. There was also a report indicating that conclusions are being reached on at least one phase of the general problem dealing with the interchangeability of common salt and Glauber's salt in dyeing, particularly on wool. At a forthcoming meeting it will be decided whether to keep the material within the committee while doing further work, or to release it for mill experimentation.

Fastness to Washing

C. A. Seibert reported. As a result of its extensive study of commercial laundering on many typical fabrics this committee will project its work in two directions: (1) Increasing the severity of the present No. 3 wash test by altering the test conditions, or even using a different apparatus. (2) Study the useful life of colored fabrics in terms of laundering and wear by consumer research. This will be done by cooperation with the American Standards Association and the J. C. Penney Company.

The report on the correlation of commercial laundering studies with AATCC test methods representing the progress of the last three years of study is promised for early report in the American Dyestuff Reporter.

Dimensional Changes in Textile Fabrics

Dr. W. E. Coughlin reported. As a result of concerted action of the committee it has been decided to use a temperature of 100° F. as standard in this work for both machine and hand laundering. Investigation develops the fact that this is now practically a standard temperature both in commercial laundries and in home laundering, either by hand or machine

methods. The AATCC committee will cooperate with the Home Laundry Machine Manufacturers Association in arriving at standard conditions not only with respect to temperature but also to other factors such as reduced speed of agitation.

John Dalton, in reporting for the Boston Area Wool Shrinkage Sub-Committee, described work done on four all-wool fabrics. An examination of the data developed by their tests suggests certain conclusions, such as (a) Relaxation shrinkage, where spraying is used as the wetting process, is appreciably lower than that obtained through soaking the fabric or through a combination of spraying and steam pressing. (b) Lowest shrinkages were obtained by hand treatment. Of the machine washed fabrics, those processed by the American Institute of Laundering showed the lowest shrinkages while the fabrics washed in a home washing machine revealed the highest shrinkages. (c) Worsted fabric, evidently because of inherent resistance to washing, showed low shrinkages indicating that the type of washing procedure used within the limits of those investigated is of much less significance with worsted than with easily felted woolen fabrics. It is evident, however, from the shrinkage results obtained that an unstabilized wool fabric will show high shrinkage in almost any machine washing test method. On the other hand, shrinkage results on woolen fabric will vary to a very marked degree depending upon the type of procedure used. With worsteds, the generally low shrinkages obtained by all methods indicate that a latitude in testing method would not be too serious.

Dr. Coughlin read a report from J. E. Goodavage for the Sub-Committee on the Evaluation of Shrinkage Control—Wool Socks. This committee is cooperating with the National Association of Hosiery Manufacturers. The interest is in developing an accelerated laundering test by which it would be possible to evaluate a shrink resistant treatment on wool hosiery and be able to translate it in terms of a given number of consecutive launderings. It was originally decided that the type of socks to be used in the evaluation work would be the all-wool anklet type made of 60-40s wool of plain knit construction on a 132 needle machine. After knitting, the socks are to be scoured and boarded to size. They will be distributed to the different manufacturers who will supply respective shrink resistant treatments. After being treated and boarded to size, the treated socks will be coded and distributed to the various laboratories who are cooperating in the evaluation. After being subjected to several types of launderings shrinkage will be evaluated by the Schiefer machine. Because it has been decided to include a wear test, it was subsequently decided to change the style of sock from anklet to full length.

Fastness to Light

W. A. Holst reported progress. First, it is expected that shortly a supply of blue calibration papers from the Bureau of Standards will be available. These will be beater dyed instead of calender stained. Tests will be made by the committee on these papers. Second, the committee is cooperating with Atlas Electric Devices Company in correlating their Twin Arc Weatherometer with the National Carbon Accelerated Weathering Unit, on which so much work has already been reported. Third, the committee is cooperating with the General Electric Company in the development of a photoelectric integrating exposure meter (Totalux). If this project is successful the need for calibration papers will be eliminated.

Fastness to Perspiration

John Dalton gave a progress report for his committee stating that while there is no definite information available now, his committee hopes by the next meeting to have drawn up a revised method of test. The committee has approved a six-fiber test cloth for their tests, feeling that the three-fiber newer test cloth is not satisfactory for their purpose. The committee will also review the present rating of perspiration fastness. Mr. Dalton stated that the committee does not approve the method suggested in the *Journal of the Society of Dyers & Colourists* as it is not only slow but not flexible. The committee plans to look into the testing of utility fabrics.

Fire Protection of Textiles

Mr. Timmons turned the reports over to his Sub-Committee Chairmen who reported as follows:

Flammability of Consumer Textiles: Dr. H. E. Hager, Chairman, stated that because of wide variations in tests on different machines and with different fabric constructions, the committee recommends that their standard still be considered temporary. Work has been done on the proper drying of samples for test, and collecting samples for cooperative testing in six laboratories.

Fire Resistance of Textiles: J. R. Redmond, Chairman, read the report which will be submitted for the coming Year Book of what has been done and then gave a report on what will be done. A new cabinet has been constructed which is larger and contains a new type sample holder. It was also recommended that the test method as published in the 1945 Year Book be accepted as a tentative method. This was so moved, seconded and voted. The committee will now take decorator fabrics into consideration.

Small Color Differences

Due to the absence of Mr. Knowland, Chairman, Mr. Holst reported that a group is now receiving twenty test cards each which will be used with three devices under observation and also give a tabulation of their acceptance or rejection by the industry with reasons. Because of poor health Mr. Knowland will have to relinquish the chairmanship of this committee and Frank O'Neil has consented to take over.

Analysis of Fiber Mixtures

In the absence of Mr. Christison, Chairman, Professor Skinkle read the report. The committee is at present working on two methods for the determination of nylons in blends: (1) The formic acid method and (2) the 1:1 hydrochloric acid method. After comparison of these methods and checking details of procedure one of them may be recommended for the Year Book.

Published work on the use of various concentrations of sulfuric acid in fiber analysis indicates the possibility of a simplification of the AATCC 70% sulfuric acid method. This method is now carried out in two steps. It is planned to determine if it may be carried out in a single operation at room temperature. It is the understanding of the committee that casein fiber is no longer being manufactured in this country. The committee, therefore, plans to continue its work using blends of wool and such vegetable protein fibers as soy bean and peanuts.

Water Resistance

In the absence of the Chairman, H. C. Allen, Mr. Nute reported on their recent meeting. There was some discussion of methods of test for the proposed commercial standards to be approved by the Federal Trade Commission. Since three different methods for dry cleaning are under consideration, it was emphasized that any fastness tests which are set up should be severe enough to show the difference between durable and non-durable finishes. After considerable discussion of the relative merits of using solvent containing soap, Mr. Little moved that a committee be appointed to study the importance of soap in dry cleaning and to work out a dry

cleaning test. The following committee was appointed:

George A. Slowinske, *Chairman*
Charles W. Dorn
Hector C. Borghetty
Carl R. Bellwova
Raymond A. Pingree
Alden D. Nute.

There was considerable discussion of the correlation of rain testers with rain room results. After long discussion, with general participation, several constructive suggestions were made: It was felt that more tests should be performed in the Bureau of Standards Rain Room and in the Philadelphia Rain Room, whenever that is again available. There was some discussion about improving the present tentative AATCC Rain Tester, particularly with reference to the spray nozzle. The work on spray nozzles done at the Institute of Textile Technology was mentioned.

Evaluation of Detergents for Wool

Dr. Stiegler reported for Mr. Nutting, Chairman, stating that the committee is keeping in touch with Riggs & Lombard and working on changes for a new machine. A second machine is being purchased for the use of the cotton group.

Standard Soil

Dr. Draves reported for Mr. Vitalis, Chairman. A progress report is being prepared for later publication. Ten cooperating laboratories discussed the results of their testing of soil cloth. Some correlation of results is indicated. However, the committee has agreed to run the same tests over again with refinement of details to avoid any possible misunderstanding. This work is all being done on cotton soil cloth and others will be considered later. There is considerable enthusiasm in this program.

Ageing of Textiles

Mr. Dean, Chairman, reported. It was agreed by committee members that present lines of work will be continued, including exposure tests, to build up dependable patterns of natural weathering deterioration in textiles of different construction when subjected to varying seasonal and climatic conditions. Efforts will be directed to work out laboratory procedures of such nature that they may be employed with some confidence to predict probable service performance. The main emphasis on weathering deterioration at this time will be placed on cotton as a standard reference material. Work is also going on with the Carbon Arc Water Spray type of accelerated weathering unit. Much work remains to be done, however, before the instrument can be employed with confidence to evaluate textiles and finishes for end uses. Consideration was given to the new tape constructions of cotton and other fibers which have been selected by the Quartermaster Corps for use in weather exposure work. It was agreed that these will furnish good standard test materials for committee use. Progress is reported in the study of the deteriorating effects of light on textile fibers. A review of the literature in this field, which has appeared during the past 20 years, has been practically completed.

Insect Pests

Herman Wilde, Chairman, reported. Tests are now being run on treated and untreated material of seven types of fabrics. The methods of test are about the same that were used in the earlier tests but the approach is different. Mr. Wilde gave some interesting data on the amount of work being done: There being over 5,700 samples of the seven fabrics involved; 25,000 insects, and about 1,800 weighings. The committee expects to have a complete report in a few months.

Frank E. Fleming of Goodall Worsted Company who was a guest at the meeting, spoke briefly, indicating his appreciation of the vast amount of voluntary work that the various members of these committees are doing.

Those present at the meeting were:

J. R. Bonnar, presiding.
H. W. Stiegler.
Wm. D. Appel.
L. G. Atkins.
E. C. Atwell.
Elmer C. Bertolet.
K. H. Barnard.
George L. Baxter
Wm. H. Cady.
H. C. Chapin.
H. M. Chase.
W. E. Coughlin.
J. N. Dalton.
J. D. Dean.
C. W. Dorn.
Carl Z. Draves
H. A. Ehrman (Guest).
A. W. Etchells.
Frank E. Fleming (Guest).
H. E. Hager.
H. C. Haller.
A. E. Hirst.
W. A. Holst.
R. W. Jacoby.
N. A. Johnson.
P. J. Kennedy.
R. H. Kienle.
D. X. Klein.
M. H. Klein.
L. O. Koons.
C. Wendall Lever.
L. Little.
Julian Maas (Guest) .
J. Mack.
A. R. Macormac.
E. Meili.
W. R. Moorhouse.
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C. A. Seibert.
J. H. Skinkle.
Hobart Souther.
Frank Stutz.
H. H. Taylor.
P. Theel.
N. J. Timmons.
Fred R. Tripp.
John F. Warner.
H. E. Wilde.
P. J. Wood.

Technical Program

Augusta Convention

October 21-23

Persons desiring to contribute papers for the Technical Program or who have suggestions for desirable topics and authors should advise Dr. Miles A. Dahlen, Room 8518, Nemours Building, Wilmington, Delaware, as soon as possible.

See page P183, March 22nd issue, for details of the technical program.

Nylon

*Some of its Properties and Applications**

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"WHY does the duPont Co. want to waste time with this chewing gum?" Those were my words ten years ago when I was asked to transfer a spool of undrawn Fiber 66 to another package. Little did I realize that ten years hence I would be talking before this group about nylon, one of the most spectacular developments in the 147 years that the duPont Co. has been in existence. It was to receive more free publicity and general acceptance in a short time than most of us could have imagined possible.

First we see it conceived by Dr. Wallace H. Carothers, a great chemist, engaged in fundamental research. It was a test tube baby born in the laboratories of the duPont Co. in Wilmington, Delaware. It was destined to be an unusual child, for shortly we see it in the romantic role of a young, strong, tenacious, supple Romeo making a play for Lady Hosiery and winning her favor. Next we see it in the services of our country supporting our airmen as they floated to earth, protecting others from tropical flies, mosquitoes and bugs, keeping others warm and protected from the Arctic elements, the towing link of personnel and cargo on land, sea and in the air, as vests to protect our men from bullets and shrapnel, and many other uses too numerous to mention here.

Then we see it returned from the services to the open arms of Lady Hosiery. She had been keeping legitimate company with another suitor, who almost too willingly stepped aside.

Restless, having grown in stature and pursued by many others who knew that it could never be for one only, Lady Lingerie became very interested. Unfortunately, she was so smitten with him in his uniform that she couldn't wait for him to get completely changed to his "civies" before introducing him around. The result was a few social blunders that caused some of her friends to frown on him until they realized the awkward position he was in. Since then, they have appreciated his better qualities, and he is in very good favor again.

Like most good veterans, who have first to satisfy themselves that they have lost no ground, he now began thinking of applying many of the things he had learned in service; ropes for mule spinners; cable coverings for use in mines and in oil wells; fabric for airplane, tractor, truck and passenger car tires; sutures in surgery fabrics; tapes; lacings for artificial limbs and surgical garments; airplane propeller and wing de-icers; diaphragms for fuel pumps, etc. Then there are the usual textile applications; tricot underwear; woven lingerie and foundations; curtains; draperies; upholstery; seat covers; lace; braid; fish lines; sewing thread; linings; and many others. So, for a ten year old, we think you will agree we have our hands full.

Let's give him a physical examination. (See Tables).

Physical Properties

TENSILE STRENGTH AND ELONGATION.—Nylon can be manufactured so that it will have relatively high or low tenacity, as desired. The lower the ultimate (breaking) elongation of nylon yarn, the higher the tenacity for any given type of nylon. Yarn is currently being made with a range from approximately 4.5 to 7.5 gm./den. and with an average elongation of 15% to 45%. The 45% is for a very special type of production used as 20 denier in insulating wire. The tenacity of thoroughly wet nylon is 80% to 90% of its dry tenacity, while the elongation of wet nylon is 5% to 30% greater than that of dry nylon. Table I gives some typical examples of yarn conditioned at 72% relative humidity at approximately 75° F.

Standard and high tenacity yarns show no loss in tenacity and only slight decrease in elongation when chilled in dry ice.

Nylon yarn has a lower tenacity at elevated temperatures than at normal temperatures. This is an instantaneous effect that has no connection with the loss of strength upon prolonged exposure to oxygen at elevated temperatures.

FIBER DENSITIES.—From Table II, it appears that nylon should be bulkier and give more coverage than any other common textile fiber for yarn of a given weight, but such is not the case. First, nylon is comparatively translucent, particularly in the low twist, bright yarn form. Secondly, the thread is extremely

TABLE I
Tensile Strength and Elongation

Denier	*Filament Count*	*Type*	*Average Tenacity Range*	*Average Elongation Range*
			Gm./Den.	(%)
15	1	200	5.2-5.5	25-28
20	7	200	4.6-5.0	19-22
20	20	109	4.2-4.6	45-55
30	10	200	4.8-5.2	20-25
40	13	200	4.5-4.8	20-25
50	34	200	4.9-5.3	20-25
60	20	200	5.0-5.4	20-25
70	23	200	4.8-5.2	20-25
70	34	300	6.0-6.4	17-22
70	34	400	6.2-6.6	17-20
100	34	300	6.4-6.8	16-19
100	34	400	6.4-6.8	16-19
150	68	300	6.1-6.5	18-21
150	68	400	6.0-6.4	19-22
200	34	400	7.3-7.7	14-16
200	34	500	5.1-5.5	19-22
210	34	300	7.3-7.7	14-16

* Presented at Meeting, Rhode Island Section, January 30, 1948.

TABLE II
Fiber Densities

Fiber	Density G./CM³
Acetate Rayon	1.33
Aralac	1.29
Asbestos	2.10-2.80
Camel Hair	1.32
Cotton	1.50
Cuprammonium Rayon	1.52
Fiberglas	2.56
Fortisan	1.52
Hemp	1.48
Jute	1.48
Linen	1.50
Mohair	1.32
Nitrate (cellulose)	1.54
Nylon	1.14
Permalon	1.72
Ramie	1.51
Saran	1.72
Silk:	
Raw	1.33
Boiled-Off	1.25
Tussah Silk	1.27
Velon	1.72
Vinyon	1.35
Viscose Rayon	1.52
Wool	1.32

compact, due to the fact that each individual filament is uniformly circular in the cross section and is free from surface irregularities, being similar to glass rods in this respect. Sheer fabrics of nylon, therefore, appear sheerer than those of similar construction made from silk, for example.

ELASTIC RECOVERY AND STRETCHABILITY.—The elastic recovery is the ability of a material to regain its original length after being stretched. The length of time required for the yarn to recover its original length is important. Without elastic recovery, it is not possible to produce fabrics which will maintain their original shape or conform to specific contours of the body. The cling or fit of nylon and silk hose results from the inherent elastic recovery of these two fibers.

When nylon yarn is allowed to relax against no load after it is held under tension for several days, it does not immediately return to its original length, but creeps back slowly. However, it almost instantly recovers approximately 50% of the stretch imparted, and will, during the first 24 hours, recover a total of approximately 85% of the amount of stretch. It will require approximately two weeks for the stretched yarn to recover completely and return *to its original length.* Yarn subjected to high temperatures or high relative humidity will return to its original length more rapidly.

TABLE III
Elastic Recovery

(a) Recovery against no load, stretch 100 seconds, recovery within 60 seconds.

% Stretch	% Elastic Recovery Silk	% Elastic Recovery Nylon
2	—	100
4	76	100
8	56	100
16	47	91

(b) Recovery against a load of 0.25 grams/denier, stretch for 30 seconds, recovery in 60 seconds.

	After Stretch Of 1%	2%	4%
Nylon	38%	63%	73%
Silk	82%	74%	59%

TABLE IV
Modulus of Strength

Fiber*	Modulus of Stretch (Gm./Den. Per 1% of Stretch)
Silk	0.75-1.16 gm./Den. per 1% Stretch
Wool	0.30-0.40
Nylon (at 50% R. H.)	0.31
Cotton	0.50
Glass Yarn	2.75
Cellulose Acetate	0.40
Viscose Rayon	0.70
Ramie and Cuprammonium	0.90

Nylon:*	Modulus For Low Stretch Range		Modulus for High Stretch Range	
Package	Modulus	Stretch Range	Modulus	Stretch Range
Pirns	0.41	0%- 5%	0.63	5%- 9%
Skeined & Relaxed	0.22	0%- 6%	0.56	6%-11%
Skeined-Steam Shrunk	0.14	0%- 7%	0.20	7%-14%
Skeined-Steam Shrunk-Background	0.17	0%-10%	0.30	10%-19%

* Note: Nylon samples conditioned at 72% Relative Humidity and 78° F. All other fibers conditioned at 50% Relative Humidity and 25° C. (77° F.)

Relative Humidity (%)	Modulus Of Stretch (GM./DEN. for 1% Stretch)
0%	0.48 gm./den
50%	0.31
100%	0.116

TABLE V
Shrinkage and Swelling

Treatment Temp. (O. C.)	Steam Press (Gauge)	Shrinking Medium	Time (Minutes)	Shrinkage Pirns Actual (%)	Pirns Residual (%)	Cones* Actual (%)	Cones* Residual (%)
25° C.		Water	3 min.	4.7	4.4	0.3	3.9
80° C.		Water	3 min.	7.5	1.0	2.3	1.2
100° C.		Water	3 min.	8.8	0.2	3.5	0.0
100° C.	Atmos.	Sat. Steam	3 min.	7.9	0.8	3.6	0.8
100° C.	Atmos.	Sat. Steam	10 min.	8.5	0.0	3.6	0.6
100° C.	Atmos.	Sat. Steam	30 min.	8.4	0.4	4.4	0.0
121° C.	15 Lbs.	Sta. Steam	3 min.	9.7	0.3	5.4	0.3
121° C.	15 Lbs.	Sat. Steam	10 min.	10.0	0.2	5.8	0.0
134° C.	30 Lbs.	Sat. Steam	3 min.	11.5	0.2	7.3	—0.3
134° C.	30 Lbs.	Sat. Steam	30 min.	11.7	0.0	8.1	—0.3

* Cones: Twistsetting conditions—180° F. Dry Bulb, 170° F. Wet Bulb—for 2 hours—before sizing.
NOTE: Original yarn lengths were measured within 5 minutes after removing yarn from packages. The actual shrinkage values above represent "unrelaxed" yarn shrinkages.

The delayed recovery should be considered a part of the total residual shrinkage.

MODULUS OF STRETCH.—Nylon yarn requires less tension for a given amount of stretch than most common textile fibers. This refers to unsized nylon, since the effect of size on modulus varies with the amount and the type of size material. The modulus of stretch may be defined as the ratio of the increase in load to the increase in elongation. Thus, if an initial load of 2 grams/denier produced 5% elongation, the modulus is 2 divided by 5 or .4 grams/denier per 1% stretch between 0 and 5% elongation.

From the tables, it is seen that the thread tension should be as uniform as possible in order not to introduce large variations in the amount of stretch. As someone has aptly expressed it, nylon should be handled as though it were a rubber yarn. Although it possesses elasticity as does rub-

ber, nylon yarn does not recover or snap back after release of tension as quickly as rubber. Like rubber, it constantly tries to return to its original length when held in a stretched condition, and will exert a relentless, crushing force upon any package on which it is wound until allowed to contract. In view of the crushing force exerted by stretched nylon, it is extremely important that tensions employed in winding cones, spools, bobbins, beams, etc. be held to a minimum value consistent with proper performance, and that proper consideration be given to the quantity of yarn per unit package. The more wraps the package contains, the greater the potential crushing force.

SHRINKAGE AND SWELLING.—The unrelaxed residual shrinkage of current nylon yarns as they are removed from our shipping pirns is between 8% and 12%, and usually about 9%.

Relaxation of the yarn in air for 24 hours under no tension, after being removed from our pirns, results in 2 to 2½% relaxation or contraction, which reduces the original shrinkage still remaining in the yarn by that amount, or leaves approximately 7% residual shrinkage. Some actual shrinkage data on completely unshrunk yarn direct from the pirns and on partially shrunk yarn from cones are given in Table V.

MOISTURE REGAIN.—The moisture regain of nylon at any given relative humidity is considerably less than that of other textile fibers, such as silk, cotton, wool, viscose rayon or acetate rayon. Table VI shown here gives the normal moisture regain for several common textile fibers at 65% relative humidity. Also shown in the table is the average moisture regain of nylon yarns based on its bone dry weight at a temperature of 75° F., but under varying relative humidity conditions.

HEAT-SETTING.—Nylon can be heat-set. It is this property that gives some of the permanent shape to nylon hose. This principle should be understood by those who experiment with 100% nylon or nylon blended with other fibers in order to take full advantage of the attractive possibilities offered by such blends.

It is usually necessary to set nylon fabrics to prevent the formation of permanent wrinkles during scouring, dyeing and finishing, and to make the product dimensionally stable.

The dimensional stability of properly set nylon fabrics precludes trouble due to shrinkage or change in shape. Women are finding that they do not need to stretch nylon curtains, for example, after laundering, since they are dimensionally stable. They need to give curtains, slips, and other nylon things only a slight pressing with a warm iron to smooth out the few shadow wrinkles which may develop during laundering. It is important that the commercial finisher be familiar with the physical properties of nylon which are involved in the finishing of fabrics made from it.

TABLE VI
Moisture Regain

Fiber	*Regain at 65% Relative Humidity*
Wool	15%
Viscose Rayon	12%
Silk	11%
Mercerized Cotton	11%
Linen	8%
Acetate Rayon	6%
Nylon	4%

Setting of nylon goods is accomplished by various processes, which subject the fabric to varying degrees of heat, moisture, pressure and time, depending upon the fabric being processed and the desired finishing qualities. In the trade, the finisher is interested in setting according to the simplest and most inexpensive method. The usual method is to subject the fabric to the action of water at boiling temperatures for periods of half an hour to an hour. For broad woven fabrics processed on a jig the setting is accomplished automatically by scouring and dyeing at a boil.

Saturated steam is also used in setting nylon. Usually, this is accomplished under steam at 15 to 30 lbs. pressure for a few minutes. Warp knit fabrics are very successfully being set in a smooth condition while on rolls, in a chamber with live steam under 10 to 20 lbs. pressure, from 10 minutes to half an hour.

Setting can be accomplished by passing fabric over heated rolls or subjecting to hot air, as on an enclosed tenter frame at temperatures ranging from 400 to 475° F. Usually, this can be accomplished in a matter of seconds. Nylon is, however, never absolutely set.

Without entering into more details regarding this subject, I think it will suffice to say that unusual dimensional stability is possible through the proper setting of nylon.

Additional Characteristics

A few more interesting properties of nylon follow:

Synthetic perspiration prepared in both acid and alkali solutions was found to have virtually no effect on the tensile strength and color of a woven nylon slip fabric during exposure under a wide range of temperatures in our laboratory.

TOXOLOGICAL PROPERTIES. — Repeated experiments and continued experience have proven that the type of polymer which goes into the nylon yarns now being delivered does not possess harmful toxological properties and is incapable of causing skin reaction. Dr. Louis Schwartz, formerly in charge of dermatitis investigation for the U. S. Public Health Service, has conducted some investigations and issued a report called, "An Outbreak of Dermatitis from New Resin Fabric Finishes", also "Dermatitis From Wearing Apparel." In these pamphlets, he confirms our statement that nylon does not possess harmful toxological properties.

INFLAMMABILITY.—In our experiments and experience, it has been shown that nylon yarn is followed by wool, silk, rayon and cotton in resistance to burning. These facts were confirmed by tests of woven fabrics conducted by Associated Mutual Fire Insurance Co., and their bulletin issued August 15, 1940, entitled, "The Fire Hazard of Nylon" confirms this statement. Undyed, finish-free nylon yarn will melt at a temperature of approximately 480° F. if a flame is applied. However, as soon as the flame is removed, the melt will drop away and harden with little or no tendency for further flame propagation. The term "flame-proof" as applied to fabrics implies a resistance to any spread of flame after the fabric has been ignited. Undyed, unfinished nylon may, therefore, be considered flame-proof.

CHEMICAL RESISTANCE.—The tenacity and elongation of nylon yarn are substantially unaffected by the following materials: Alcohols, Aldehydes, Alkalies, Benzene and Benzine, Carbon Disulfide, Carbon Tetrachloride, Gasoline, Halogenated Hydrocarbons, Ketones, Soaps, Trichlorethylene. Sodium Hydroxide in 10% concentration, at 85° C. for 16 hours, gave no apparent degradation.

Grease and oil contamination, taken from looms from several mills and smeared on nylon parachute fabric, showed no acceleration in deterioration of fabric exposed to direct sunlight for several weeks. Acetic Acid, Hydroxyacetic Acid and Formacetic in concentrations up to 3%, and temperatures up to 212° F., had substantially no effect on tenacity and elongation of nylon yarn.

Materials having permanent effect on nylon yarns are: Concentrated Formic Acid, Phenol, Meta-cresol, Cresylic Acid, Xylenol, Trichloracetaldehyde, Benzyl Alcohol at the boil and a 20% solution of Calcium Chloride (Saturated), Methanol (heated).

ABRASION RESISTANCE.—Generally high, and oftentimes phenomenal, abrasion resistance is experienced with items made of nylon. Proper design and construction of fabrics is essential, however, to obtain maximum abrasion resistance. Fabrics made from spun nylon frequently give better abrasion resistance than fabrics made from continuous filament yarn, despite the greater strength of the latter. When blended with other fibers, such as wool and cotton, there is a surprising improvement in abrasion resistance even with small, moderate percentages of nylon in the mixtures.

INSECT RESISTANCE.—It is believed that nylon is free from attack by insects, since there is no known instance where an insect has derived nourishment from nylon. It has been demonstrated, however, that several species of insects will cut their way through fabrics made of various fibers if entrapped within them. We have no reason to believe that, in such cases, nylon would be an exception.

MILDEW, MOLD, FUNGUS RESISTANCE.—Fabrics exposed to soil burial for 21 days retained from 95% to 99% of their original strength and were relatively bright and clean after rinsing in cold water. Cotton fabrics exposed to identical conditions were completely destroyed. Nylon has exceptional resistance to mold, bacteria and marine deterioration and fouling.

LIGHT RESISTANCE.—Over a period of several years, our data on light resistance of various types of nylon and on nylon as compared with other fibers have led us to the following conclusions:

(1) For many uses, deterioration due to sunlight is a minor factor, other factors having a controlling effect.

(2) Bright nylon has much better light resistance than semi-dull (white pigment) yarn.

(3) Higher denier per filament yarns have better light resistance than lower denier per filament yarns in the range from 3 to 9 denier per filament.

(4) Cotton and linen are closely comparable with bright nylon yarns, particularly the bright 6 to 9 denier per filament yarns, for percentagewise loss in strength upon exposure to sunlight. In general, during the period of useful life, the tenacity of bright nylon yarn remains higher than that of other common textile fibers, including cotton and linen. Elongation usually parallels loss in strength. Deterioration, due to sunlight, is several times as rapid in summer as in winter. No yellowing of nylon upon exposure to sunlight has been observed. This includes severe Florida sunlight.

Applications

We have on display several items made from nylon. All of these incorporate some of the features of nylon.

SEWING THREAD.—There is hardly anything made of textile materials that does not have to be sewn. With the introduction of nylon articles, it was natural that they be sewn with nylon. Perhaps the first example of this was nylon hosiery.

Nylon has strength, abrasion resistance and most of the attributes required of the sewing thread. Like most new products possessing different characteristics than their predecessors, nylon was not, at first, found to be easily adapted to conventional type of setups used on sewing equipment. One of the principal difficulties was nylon's elongation, elasticity and low modulus. Through a hot stretching procedure, the elongation may be decreased, modulus increased, to the point where nylon is performing as well as other sewing threads on machines designed and set up for that purpose. Individual sewing thread companies have experimented with nylon and have individual technique of manufacture that is permitting its introduction in almost every field. The properties we have described before, such as freedom from rotting, mildewing, etc., all make it a very desirable fiber for sewing thread.

LACE.—Here is a beautiful piece of lace made from nylon. Its unusual strength and thermo-setting properties, plus the fine deniers, make possible the production of lace that will wear longer, will not tear and requires little or no ironing. It is a very natural trim for nylon garments because of its quick drying characteristics. Because of its strength and fine denier, beautiful, sheer constructions can be made. We believe that, given time and the proper amount of attention, nylon can be to the lace industry what it has been to the hosiery industry.

While there have been problems in setting because of lack of proper type of equipment, such as tenter frames, etc., plus the difficulty of graphite removal, these problems are fast being overcome, and today we are seeing nylon lace used by most of the outstanding lingerie producers.

TRICOT.—Here is a tricot gown. Nylon in tricot is proving to be one of the most outstanding uses. Its dimensional stability, strength, quick drying, ease of laundering, seem to open up new fields for tricot fabrics. A few of the problems attending the introduction of nylon in this field have definitely been overcome, and the testimony is the general acceptance of millions of garments made from it.

CURTAINS.—We also have here some beautiful nylon marquisette curtains. These are made from 100 denier 34 filament. Another popular count is 70 denier 34 filament. Hundreds of thousands of curtains have been made, and offer dimensional stability, ease of laundering with little or no ironing necessary, quick drying, strength and beauty. No stretching, or treatment normally required in laundering other curtains, is necessary. This dimensional stability is brought about by the proper type of heat setting. Nylon, because of its sheer qualities, lends an effectiveness that is hard to duplicate with other fibers.

ROPES.—Another application is ropes. During the war, ropes were made of nylon for towing of gliders, pickup of mail and personnel, etc. It was also used in numerous places on ships. Today, it is being used as yacht rope, mule spinner rope, spindle bands, trolley cords, lariats and "foregoers" in the whaling industry. A "foregoer" is the rope that is hitched to the harpoon.

VELVET.—Here is another material of nylon. It is an all-nylon velvet. It is noncrushable, as you might see from grinding it under your heel. A little brushing and the pile stands up as good as new. It has also been washed, and dried rather quickly, with good results.

INDUSTRIAL FILTER BAGS.—Here is an industrial application—filter bags. This is made of 210 denier and is used in water softeners. The life exceeds that of filter bags made of cotton and other fibers to the extent that the additional cost is justified. It is also used as a filter medium in processing oils, alkali solutions, etc.

SLIPS.—We also have two slips, one of nylon satin, the other of nylon taffeta. Also, we have included a cone, a bobbin and some nylon staple. I thought it might be interesting to see what the product looks like as we deliver it.

I do want to mention that most of this presentation has been on continuous filament nylon, although many of the characteristics also apply to nylon staple, which we are currently producing on a limited scale. I wish there were more time to go into the subject of nylon staple.

In conclusion, I wish to thank you for the opportunity to speak before this group. I have tried to give you a general idea of the properties of nylon. From this basic knowledge, I hope you have derived sufficient interest to want to learn more. This may also help you somewhat in your problems. I have not attempted to go into specific details, since I think much of the information that we have developed along this line could be improved further through your own efforts. Many of you have special techniques in handling other fibers in order to get the best results. I am sure that the same applies to nylon. However, we do have booklets, pamphlets and manuals for those who are sufficiently interested, and we would, upon request, be glad to offer them as they are available. I have purposely stayed away from the details of dyeing and finishing, since that is something that can be covered much more effectively by Harry F. Clapham.

The discussion which followed this paper, as well as the one by Mr. Clapham, appears on page P 301.

Nylon Dyeing*

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MR. CHAIRMAN, members and guests of the Rhode Island Section, I have been asked to talk briefly on current recommendations for the dyeing of nylon. Since you have all undoubtedly read and heard much on this subject in the past few years, the most I can hope to do in this paper is present our latest ideas on color selection and dyeing methods for a variety of uses.

Much has been learned about the application of colors to nylon and nylon blends, but the ultimate solution to all problems involving light fastness and level dyeing is not as yet available. The inherent strength and abrasion resistance of the fiber intensifies the need for the ultimate in fastness properties to give colors that last for the life of the particular item.

Perhaps a few words about the dyeing properties of nylon will be helpful in understanding the problems. As you may know, nylon can be dyed with practically all classes of dyestuffs, including acetate, acid, premetallized, chrome, direct, diazo and vat colors. However, the fastness properties of the resulting dyeings on nylon cannot be predicted from the fastness properties of the same colors on more conventional fibers. For example, vat colors, which are well-known for their extreme light fastness on cotton, in general show relatively poor results on nylon. Types which may show as much as 150 or 200 hours light fastness on cotton in the Fade-Ometer will show perhaps 15 or 20 hours fastness on nylon. This makes it obvious that an entire new background of fastness information must be developed before suitable colors can be selected for use on nylon. Added to the problems of color selection from a fastness viewpoint, there are the problems of covering junctions which apply particularly to filament yarn in hosiery, the selection of colors to minimize blocking effects, which is particularly important in heavy shades where one dyestuff may completely block off the other in a combination resulting in an entirely unexpected shade effect, and the problem of dye saturation of the fiber where it becomes impossible to build up sufficient color on the fabric to make the depth of shade required. With spun nylon fabrics, the problem of junction does not arise since blending, which occurs during the manufacture of the yarn, decreases any such difficulty. The blocking effect, and saturation point, however, still remain, and careful color selection is necessary to obviate these troubles.

In general, it might be stated that for uniform dyeing and ease of application, acetate dyestuffs offer the most satisfactory results on nylon. They are, however, deficient in wash fastness, although with selected types, satisfactory light fastness can usually be obtained. It has been found that acid dyes, pre-metallized dyes, and certain selected direct dyes offer the best all-round fastness to light and washing. There are limitations on their use, however, because of their poor leveling, and junction covering, and blocking properties.

Hosiery Dyeing

Hosiery dyeing represents the field in which the dyeing procedure is best standardized since it represents the oldest use of nylon in volume.

Current recommendations for hosiery work call for the use of acetate type dyestuffs and our recommendations are based on the use of:

"Acetamine" Yellow N
"Acetamine" Scarlet B
"Celanthrene" Brilliant Blue FFS Conc. 200%

Two types of dyeing machine are in common use, the paddle type and the rotary drum type. The latter is the more popular. On either machine, the general dyeing method is as follows:

Scour the hose at 160-180° F. with:
- 3% Soap
- 3% "Duponol" D Paste
- 2% Trisodium Phosphate

Rinse warm and add:
- 2% Soap
- 1% "Duponol" D Paste
- 1% Trisodium Phosphate
- Dispersed dyestuff (dispersed with 1% "Duponol" D Paste)

Run for 1 hour at 180° F. Give 2 warm rinses and 1 cold rinse. Add 8-10% "Methacrol" NH at 85-90° F. Raise to 120° F. Run 15 minutes. Extract lightly without rinsing and board.

The recently popular, 10, 15 and 20 denier monofilament boot stockings with 30 or 40 denier multifilament welt have presented a considerable problem in obtaining a satisfactory union between the boot and welt since the monofilament boot yarn tends to "grab" too much color and dyes much heavier than the welt. The following recently developed method has given by far the best results in practical mill application on this type of hose.

(1) Scour the hose by the conventional method mentioned above.

(2) Rinse and enter into a bath at 90° F. containing:
- 5% Acetic Acid 28% (based on weight of goods)
- 0.5-1.0% Tannic Acid (depending on depth of shade)

(3) Raise temperature to 130° F. and run 15 minutes.

* Presented at Meeting, Rhode Island Section, January 30, 1948.

(4) Add the color dispersed with 4% "Duponol" D Paste.

(5) Raise temperature to 160° F. and run 1 hour, rinse and dry.

Hosiery dyed by this method in the current darker shades have shown excellent wash fastness. Twenty-five ½-hour washings with ½% neutral soap at 105° F. still leave the hose a satisfactory color for wearing.

Acid colors have been recommended for hosiery dyeing, but our experience has indicated that the percentage of seconds, because of difficulty in pairing, is so great as to preclude economical operation.

Men's nylon hose fall into two categories, the sheer filament hose, and the heavier socks made from staple fiber usually blended with wool. For the filament type hose which are nearly always dyed into dark shades, the use of acid or diazotized and developed acetate colors is strongly recommended to avoid difficulties both with wash fastness and bleeding of color onto the feet. The following combinations have given good results in practice for the most popular shades.

Maroon — "Acetamine" Orange GR Conc. 175% diazotized and developed with "Acetamine" Developer AD Extra or beta naphthol.

Green—Du Pont Milling Yellow 5G Conc. and "Pontacyl" Fast Blue GB Extra Conc. 125%.

Brown—Du Pont Milling Yellow 5G Conc., Du Pont Milling Red SWB Conc. and Du Pont Anthraquinone Blue SWF Conc. 150%.

Black—"Acetamine" Diazo Black 3B—D. & D. with "Acetamine" Developer AD Extra.

The dyeing methods are as follows:

For "Acetamine" Diazo colors:

Scour and dye as for "Acetamine" colors.

Diazotize with:

8% Sodium Nitrite
16% HCl

For 1 hour at 80° F. Wash well. Develop with :

4% "Acetamine" Developer AD Extra
10% Acetic Acid 28%

Start at 110° F. Raise to 160° F. in 15 minutes. Run 30 minutes. Raise to 180° F. in 15 minutes. Rinse and dry.

For acid and "Chromacyl" colors, dyeings are made in the conventional manner with 1% "Duponol" D Paste and 5-10% Formic Acid 85%, depending on the depth of shade.

In heavy shades and heavier denier yarns, the acid colors exhibit satisfactory covering power. For heavier socks containing staple nylon and wool, the "Chromacyl" colors and selected acid colors offer the best all-round fastness coupled with good dyeing properties.

The following acid color types have been found useful for this work:

Du Pont Anthraquinone Green GN.

Du Pont Milling Yellow 5G Conc.

Du Pont Milling Reds SWB, SWG, 3B, B.

Du Pont Neutral Brown BGL.

Du Pont Neutral Gray L.

Du Pont Anthraquinone Blue SWF Conc. 150%.

Du Pont Anthraquinone Rubine R Conc.

"Pontacyl" Fast Blue 5R Conc.

"Pontacyl" Fast Blue GB Extra Conc. 125.%

"Pontacyl" Fast Black N2B Conc. 200%.

It is frequently necessary when developing unions on mixtures of wool and nylon to vary the selection of colors depending on a variety of factors, and this will be discussed later in the paper.

Piece Goods

The processes for dyeing piece goods of nylon are not nearly so well developed as the processes for hosiery. Not only has there been less production of piece goods because of the lack of nylon, but the fastness requirements will, in general, be much more stringent.

On light-weight, 100% filament nylon fabrics, acetate color types have been largely used because of their excellent leveling and covering properties. They do, however, leave something to be desired in light and washing fastness. During the war, the Quartermaster requested industry to develop methods for obtaining improved wash fastness for O.D. No. 7 shade on filament and spun nylon fabrics. Acid and chrome colors showed much promise, but on filament yarn the problems of warp streaks and filling bars was not entirely overcome. Recently some of the heavier satins used for auto seat covers, etc., have been dyed with selected acid color types with good results. The dyeing is done in the jig, and a closed jig, where the temperature on the roll as well as in the bath can be maintained close to 212° F., is necessary to obtain the best penetration, color value, and fastness, especially to crocking. This is because the critical dyeing temperature of acid colors on nylon is very close to 212° F., and much below that temperature the nylon does not swell and accept the dye properly.

Staple nylon fabrics present a less difficult problem in obtaining even dyeings, since the junction difficulty is eliminated by the blending that takes place during the manufacture of the yarn and fabric. Acid colors are recommended for this type of fabric to give the ultimate now obtainable in light and washing fastness.

Nylon-Wool Blends

Blends of nylon and wool will probably represent one of the most important fields for nylon. It has been stated that each per cent of nylon added to a wool-nylon blend will increase the yarn strength 4%, thus yielding much stronger light-weight fabrics which will find considerable use in service suitings, etc. The dyeing of such blends calls for careful color selection to obtain good unions with satisfactory color fastness.

For the dyeing of wool-nylon unions careful color selection is necessary, since both wool and nylon have affinity for the same type of dyes. In many cases with single dyestuffs, it is possible to obtain a good union on both fibers by minor variations of the dyeing method; however, it is not necessarily true that these dyes will still produce a good union when dyed in combination with each other. This, of course, is a manifestation of the well-known "blocking-off" effect previously mentioned.

To my knowledge, there is no way at present to predict which dyes will and which will not cause "blocking-off," except by the trial and error method. The optimum method for overcoming this effect is to select combinations of dyestuffs that dye at the same rate and penetrate the fiber to the same degree. Obviously, it is not always possible to approach your dyeing problem with such dyes, and a further method of circumventing the possibility of a poor union due to "blocking-off," is to enter an additional dye into the combination with the opposite effect to the one causing the trouble.

Without going into dyestuff selection at this point, here is an exhibit that demonstrates fairly clearly the effects and remedies I have just described. In the first case, a yellow, red and blue were combined to produce a given shade. Incidentally, each of these dyes produces a fairly good union on both fibers by itself. As you can see, we do not have a very satisfactory union. On the other hand, by changing our selection of dyes, we can produce a similar shade and at the same time obtain a satisfactory union. As an illustration of the second method of producing a good union, we have added a fourth color to the combination which corrects the off-shade effect.

These examples, by the way, were all made up with fast-to-light acid dyes. The same effect is shown with premetallized dyes as well as direct dyes and milling dyes. As a matter of fact, we have illustrated dyestuff behavior on wool-nylon mixtures representative of all dyes which dye on both fibers.

It is neither practical nor possible in this short paper to develop specific dyestuff formulas which will be satisfactory for any and all problems in connection with the dyeing of these fiber mixtures; however, a brief general discussion of each group of dyes may be helpful.

Level dyeing acid dyes should be applied from an organic acid bath such as formic or acetic acid rather than from sulfuric acid. Laboratory work to date indicates that sulfuric acid has a rather marked deleterious effect on nylon, and should be avoided. The use of Glauber's salt is not especially desirable for dyeing nylon; however, inasmuch as we are dealing with wool-nylon blends, its use may be warranted, although excessive amounts should be avoided.

It is well-known that these dyes possess good transfer properties on wool, and even in the presence of nylon transfer will take place. Nylon introduces a new condition, however, since these dyes will not transfer from nylon. On the other hand, any color which transfers from the wool will be largely taken up by the nylon, thus introducing a new variable into the dyeing procedure. The one limiting factor here is the saturation value of the nylon. As a matter of fact, if the usual transfer test is carried out by the addition of undyed material to the bath after regular dyeing, you will find that the original dyed wool will lose very considerably in depth, while the original dyed nylon is relatively unchanged.

Temperature and time of dyeing are also factors, but suffice to say the higher the temperature and the longer the time, the better dyeing that will be obtained on the nylon. All of these factors can be varied as required to help in solving specific problems.

The milling acid dyes follow the same general pattern as the level dyeing types. Dyeing can be carried out with a weak acid such as acetic, or an acid salt such as ammonium sulfate or acetate. Dry transfer does not enter the picture with these colors, and obviously every usual precaution necessary for uniform color application should be taken.

The "Chromacyl" or premetallized dyes react in much the same manner as the level dyeing acid dyes, and the same general factors as previously described hold true. In view of the detrimental effect that sulfuric acid has on nylon, its use should be avoided.

Chrome colors, of course, present the problem of obtaining complete lake formation on the nylon without overchroming the wool. Our experience in the laboratory has shown that certain blends of wool-nylon dye and chrome quite readily, while others require very severe conditions. The factors to be borne in mind are that an average amount of chrome, at fairly low pH values, for periods of about an hour at the boil, represent the best conditions for lake formation on both fibers in the blend. If chroming under these conditions is not sufficiently complete on the nylon, it will be best to consider another dye combination. Chromate dyeing with selected types also yields good results and offers advantages for shade control and matching.

Bottom chrome dyeing has not as yet proved successful for nylon dyeing, and cannot be considered for wool-nylon blends.

Generally speaking, most of the wool dyes have light fastness on nylon about equal to that on wool, and wet fastness at least equal to that on wool.

It is worth repeating that proper color selection is of prime importance for the production of a good union on wool-nylon blends, and that the changing of the blend in any respect may upset the dye formula completely and necessitate a complete revision.

The two types of dyeing not covered so far are yarn dyeing and rawstock dyeing. Color selection is in general the same for these forms as for piece goods. Filament yarns have largely been dyed with acetate colors in skein form to date, but with proper winding it is possible to obtain satisfactory results in the package machine. Acid colors present the usual junction difficulties, but can be applied in specific cases.

Staple yarn and rawstock can be satisfactorily dyed in circulating machines using acid color types, provided careful color selection is made to obviate difficulties of blocking and selective dyeing.

Summary

To summarize briefly, nylon has affinity for practically all classes of dyestuffs, but their properties on nylon vary widely from the same colors on the older fibers. Filament nylon presents more problems in even dyeing, and for a large majority of uses acetate colors are recommended, although for the best fastness acid colors should be used. Spun nylon mitigates some of the difficulties presented by filament nylon, and is best dyed with acid color types.

Finally, it should be stressed that although a good fund of knowledge is being built up about the dyeing behavior of nylon, it is well to evaluate each new blend or fabric in the laboratory, especially for fastness to insure adequate coloring for the job.

* * * * *

Discussion

Q.—Users of nylon sewing thread, in the home, are frequently troubled with knotting and kinking. Can you tell us what causes this condition?

Mr. Hazlewood:—It may be due to improper setting of twist or too high a twist. Static electricity caused by friction in the sewing may cause this kinking. Frequently the use of a needle with too small an eye tends to back up the twist which also causes kinking. Sewing thread for home use is not always made to withstand the same drastic conditions that are common to commercial sewing threads.

Q.—In the manufacture of nylon, is graphite used, and how can it be removed from nylon?

Mr. Hazlewood:—Graphite is not used in the manufacture of nylon. It comes from the lace machines and is very difficult to remove. The best method of which we know is a strong soap boil-off plus common assistants with a vigorous mechanical agitation.

Q.—What causes the variations common to nylon?

Mr. Clapham:—These variations occur during manufacture and even though every control known is used, variations are apt to occur. Mechanical handling, can and does cause variations, such as draw-ratio, tension, etc. Winding, warping, weaving tensions also cause such variations. Acid colors bring out and accentuate these differences.

Q.—Do acids affect nylon?

Mr. Clapham:—The mineral acids have a deleterious effect on nylon. Based on time and concentration, sulfuric acid and hydrochloric acid should be avoided as they are the worst offenders. Formic and acetic acids in concentrations under 10% on the weight of the material have very little effect on nylon.

Q.—Does the heat treatment or setting of nylon alter its melting point?

Mr. Hazlewood:—No. The melting point still remains at 470-475° F.

Q.—Is it possible to stiffen nylon sewing thread to prevent puckering during sewing and then remove stiffening agents during finishing?

Mr. Clapham:—While a certain amount of pliability is necessary for sewing, it is possible that such a stiffening agent might assist in the problem. It is worth investigation.

Q.—What can be done to prevent fusing of nylon sewing thread in machines running at 4500-5000 stitches per minute?

Mr. Hazlewood:—Very little, if anything, can be done to the nylon. Changing the type of needle or the set-up used in threading, altering the tension, etc. may overcome this difficulty. Coolants have al-

so been used with some success. Though other fibers do not fuse, frequently damage is caused by excessive heat which will be responsible for difficulties later on.

Q.—Why does bright nylon resist light deterioration better than dull?

Mr. Clapham:—The use of titanium dioxide as the dulling agent tends to aggravate deterioration from light. It may also be that since bright nylon reflects light to a greater degree, the fact that less light is absorbed reduces damage from light.

Q.—Is it necessary to preset nylon fabrics?

Mr. Hazlewood:—Yes, where the fabrics are later exposed to conditions under which wrinkles might be set in them. Presetting under smooth conditions, at temperatures and/or time exceeding the subsequent conditions where wrinkles might be introduced, prevents such wrinkling.

Q.—How is nylon preset?

Mr. Hazlewood: — The presenting of nylon is a function of time, temperature and moisture. Best results and the safest method of handling are with steam or hot water. Dry heat can be used but requires more control to prevent the melting of the fiber. Hot roll methods of finishing are proving very successful and impart exceedingly soft and luxurious hand to the fabric.

Q.—Can nylon yarn be resisted so that it can be used for decorations?

Mr. Clapham:—Yes, to some degree. Some decoration yarn manufacturers have been able to resist to the point where the colors are satisfactory to piece dyeing when used as striping yarns in worsted and woolen fabrics, etc. A suitable resist for white has not as yet been developed. The current range of colors is rather limited. However, new ones are being added regularly.

An Electrolytic Method for Stripping Color from Dyed Wool*

By ERNEST R. KASWELL and GEORGE THOMSON

Presented for the

NORTHERN NEW ENGLAND SECTION

Discussion

Chairman Linberg: Thank you very much for your fine paper. Are there any questions?

Question: How much electrical power do you use?

Mr. Kaswell: Well it depends, of course, upon the size of the apparatus. I am not going to tell you, for our little laboratory unit, what the order of magnitude of either the amperage or the voltage is, but it is low.

Question: How much would it cost for a mill-size plant?

Mr. Kaswell: We don't know; we are strictly in the pilot plant stage; but it is obvious from the nature of the reagents that you can't use the process with an open wooden tub, or any kind of open system for that matter. One should have a closed system. It must be chemically and electrochemically engineered, with the proper equipment, made out of the proper material, in order to operate at peak efficiency. Of course there is plenty of room for improvement in the stripping process as presently carried out in the average mill. It is grossly inefficient to use an open tub, where a large surface is exposed to air, and oxidation takes place.

Question: In the books on theoretical chemistry, they say that in electrolytic oxidation-reduction cells, efficiency of reduction depends on the ratio or relative proportion of two species, the reduced, and the unreduced. Do you, substantially, have a fifty-fifty proposition here, or do you have some other ratio?

Mr. Kaswell: In other words, you want to know the percentage of chromium or other reducing ion?

Question: No; when you have chromium ions, some chromous and some chromate, there is a proportion between them and the reducing effect depends on that proportion.

Mr. Kaswell: Well, I don't know as there *is* a fixed equilibrium of "ous" ion to "ic" ion beyond which you can't go. I think the greater the efficiency with which you can operate, the greater percentage of ions in the lower valence state you will have present.

Question: If you should analyze your product, would you have 95 per cent chromous and 5 per cent chromic, or what?

Mr. Kaswell: I would say probably in a closed system, and we don't have a closed system in our little laboratory batch cell, that you could probably obtain somewhere around 95 per cent reduction. It is quite a problem to try to titrate the reducing power of the solutions because they are colored, and one cannot use indicators to titrate. You must use a potentiometric titration. We have tried that and we haven't had too good luck. We find 40 to 65 per cent of the ions present in the reduced state, but undoubtedly we lose some by air oxidation in the process of titration.

Question: Do you think it would be possible to strip piece goods in this fashion?

Mr. Kaswell: In so far as stripping piece goods, or stock, or any particular type of goods is concerned, it would be purely a question of proper design and engineering of the equipment. We can visualize a unit cell to produce the reagent in as large or small a quantity as desired. Then it would mean pumping it into some type of unit where the stock, or piece goods, or what have you, are placed.

Question: Do I understand that the samples are of the vanadium strip?

Mr. Kaswell: That is correct.

Question: After you are through with the process, is neutralizing necessary?

Mr. Kaswell: Yes; you may wash it thoroughly to get rid of the acid, or use any convenient alkali to aid in the neutralization. Of course, since it is wool, we don't particularly mind leaving it on the acid side. These samples on display have not been neutralized and are on the acid side.

Question: What happens when you dye them?

Mr. Kaswell: The dye goes on that much faster.

Question: Suppose you wanted to dye a rayon and wool mixture?

Mr. Kaswell: I guess I don't know enough about the dyeing of all different fibers to be able to know what the condition of various stocks should be before you dye them in a mix; but you can bring the wool to almost any condition you want within limits. Consider the wool to be the same as any other wool.

Question: What pH did you run?

Mr. Kaswell: Probably around 2 to 3.

Question: Is your work concerned only with wool?

Mr. Kaswell: Yes. It will not work on cotton, obviously, because of the acid, which completely eliminates all of the cellulosics.

Question: What about nylon?

Mr. Kaswell: We have tried nylon; the

* This paper was published in our February 23rd issue and was presented at the Intersectional Contest held in Chicago last October. The discussion followed its presentation by Ernest R. Kaswell at a meeting of the Northern New England Section.

May 3, 1948

hot acid doesn't do it any good.

Question: I think in wool, our biggest problem is the time it takes for the little dye molecules to worm their way into the fiber. Now if you had everything in good order, and the little vessel and everything just as you would like to have it, and you put the wool in, how many minutes would it take for the action to permeate through the wool?

Mr. Kaswell: Is this on re-dyeing or stripping?

Question: On your proposition of stripping. If everything is in perfect condition, how soon would the color all disappear?

Mr. Kaswell: A color like Chromacyl Orange R, among the samples shown here, we can strip in eight minutes, which means that the reducing agent must have gotten into the fiber in that time. In the case of indigo, it means that the stripping agent must have penetrated the fiber in that same time of eight minutes, but it has not destroyed the indigo.

Question: How long does it take?

Mr. Kaswell: Indigo will take as much as 80 minutes.

Question: Why aren't the indigos white?

Mr. Kaswell': I guess because we can't use a bleach.

Question: Well, if you can go that far, why can't you go all the way?

Mr. Kaswell: I don't know. Mr. Selya just said that some of the end products probably are colored. If we *have* completely removed the indigo, why isn't the resulting stripped sample as light as this one? Well, it jus't isn't. We undoubtedly are leaving some reduced and destroyed dyestuff in the fiber which shades it. If we take a piece of fresh white wool and put it in a fresh stripping solution for 80 minutes, we don't come out with a pure white. There is a mild discoloration.

Question: What happens to chrome dyed cloth? Is the chrome taken out of the cloth by the electrolytic process or is it reduced?

Mr. Kaswell: We have never run any quantitative analyses on the amount of chromium left. I would say that we probably remove a good percenaage of the chromium put there in the chrome color. If we use chromium as the stripping agent, we undoubtedly leave some chromium salts in the goods. To confirm this, we should chrome dye the sample, strip with titanium or vanadium, and then do a spectrographic analysis to determine residual chromium. We haven't done that yet.

Question: My thought was that it would be easy to reduce the color if the wool were unchromed. By reducing the chrome you would put it in the unchromed state, and then stripping would proceed.

Mr. Kaswell: That might be the mechanism of the action in stripping.

Question: What effect does this have on chrome botton dyes?

Mr. Kaswell: I don't know enough about the differences there to be able to make any definite statement. As far as I know, it doesn't make any difference whether you chrome bottom or top; it depends upon the final compound formed between the dyestuff, chromium, and the wool.

Question: Do you mean that the chrome bottom is destroyed during strippping?

Mr. Kaswell: I presume so.

Question: Have you any chrome bottoms there?

Mr. Kaswell: Mr. Selya will have to comment on that.

Mr. Selya: Here is a chrome bottom.

Question: Have you used your system and equipment for stripping in a separate chamber, and if you supply the stripping agent continuously, would a pressure or vacuum make any difference?

Mr. Kaswell: We think that circulation of the stripping agent to a separate chamber definitely is a help. In our little batch unit, if we circulate the liquor and agitate the wool so that we get good penetration, we can speed up the stripping time. In our circulating process, if we pump that liquor around, we can speed up the reaction; velocity of the solution through the wool is an important factor.

Question: How about carrying it out under pressure or vacuum?

Mr. Kaswell: We haven't done a thing about carrying it out under pressure. Undoubtedly, that is one of the things we should investigate.

Question: What type of materials would you use for the pump and the pipe lines?

Mr. Kaswell: Any of the materials which are acid resistant would be all right. In the laboratory, you may use glass. Otherwise, any materials that you conceivably might use in an acid plant would be satisfactory.

Question: What about cast iron?

Mr. Kaswell: We are not using cast iron. The pump is made from an acid resisting metal called Hastelloy. Of course in the laboratory work we use gless, with rubber connections.

All correspondence concerning the Employment Register should be directed to the Secretary

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May 21st Meeting, NNE Section

THE program outlined below has been arranged for the meeting of the Northern New England Section to be held on May 21st at the Andover Country Club, Andover, Massachusetts. The speakers, well informed in all fields of theoretical and practical dyeing, will answer questions and lead discussions on subjects presented.

Program

HENRY D. GRIMES, Assistant Chief Chemist, American Woolen Co., Lawrence, Mass., will be Moderator of the Meeting.

CYRIL J. BYRON, Overseer of Dyeing, Barre Wool Combing Co., Ltd., South Barre, Mass., "Dyeing of Wool Top and Raw Stock."

JOHN N. DALTON, Director of Chemical Dept., Pacific Mills, Lawrence, Mass., "Theoretical Approach to Dyeing of Woolen and Worsted Fabrics."

HENRY D. EVANS, Chief Chemist, Pepperell Mfg. Co., Biddeford, Maine, "Dyeing of Cotton Raw Stock and Piece Goods."

THOMAS F. MALLOY, Chief Dyer, Strong-Hewat & Co., Inc., North Adams, Mass., "Dyeing of Woolen & Worsted Piece Goods."

JOHN B. MORAN, Chief Dyer, Warren Fabrics Co., Inc., West Warren, Mass., "The Commercial Dyer's Approach to Dyeing Problems of Blended & Mixed Cotton and Rayon Fabrics."

Outing

The Annual Outing of the Section will be held on June 11th at the Merrimac Valley Country Club, Methuen, Mass.

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Report, North Carolina State College Student Chapter

ON April 8th the North Carolina State College Student Chapter sponsored a series of lectures by W. H. Jones of Carbic Color & Chemical Company who spoke on printing and the use and chemical properties of Pharmasols and Indigosols.

Two lectures were given to the Junior Class and one lecture and an afternoon of lecture and demonstration to the Senior Class.

Respectfully submitted,
John R. Cramsie, *Secretary.*

Package Dyeing of Yarns*

HERMAN J. JORDAN, JR.
Wiscassett Mills Company

Purpose

THE purpose of this paper is to discuss the process of package dyeing as regards the preparation of material and application of different dyestuffs in package machines.

Introduction

Package dyeing has made much progress in recent years, due mainly to modern machinery, modern methods, improved dyestuffs and auxiliaries and more "know-how". Manufacturers are constantly striving to produce better machinery, dyestuffs and chemicals; while the dyer likewise is contributing daily with new ideas and methods of application.

Material

The material for discussion in this paper is cotton yarn, dyed in package machines.

The care and treatment given cotton from the time it is planted until it is ready for dyeing influences the final outcome of the finished product.

Nature has endowed the cotton plant with the necessary oils, pectins, waxes, etc., for protection against the weather. All these things facilitate processing, that is, the refining operations, such as carding, combing, spinning and winding. To the dyer these so-called "protections" are just substances that prolong the finishing operation since they must be removed along with the other oils and dirt picked up in the refining process.

Winding

The winding operation is a very important phase of package dyeing for it is here the foundation is laid, so to speak. This is one of the secrets of success in the package dyeing industry.

Though the best grade of cotton obtainable has been carefully processed and spun, unless it is properly wound the chances are that the outcome of the dyed package will be far from that desired.

Many things must be considered when winding a package for pressure dyeing and some of these are: proper size, softness, density, angle of wind, etc.

Package Dyeing Machine

As for the dyeing machine, it may be one of several makes but primarily all work much alike. The machine proper is actually a cylindrical vat, usually of stainless steel construction with a smaller tank connected, known as an expansion tank, where the liquor, dyes and chemicals are added, and from here forced through the package by a centrifugal pump. The liquor is pumped through the line to a four way valve which allows the solution to flow from the inside to the outside or vice versa of the packages. Shifting at regular intervals is necessary for level dyeings. Pressure during the operation is usually 25 to 30 pounds per square inch, depending on the count of yarn (single or ply) temperature, type of dyeing, etc. The pump is the heart of the pressure machines at all times and should be treated with care; routine check ups are a must.

Each machine should have its own recording temperature controller and timing device in order that operations can be rigidly controlled.

The dyestuff is run into the machine from the mixing tanks. Homogenizers, paddles and steam are used in the mixing operations in these tanks to promote thorough mixing and dispersion.

Drying Operation

After dyeing and finishing the yarn is removed from the machine, extracted in a centrifugal extractor, or if on a carrier, placed in a combination extractor and dryer which removes the excess water by pressure and dried by circulating hot air through the yarn. Yarn which has been centrifugally extracted may be loaded into a tray dryer or replaced on a carrier and dried by a blower.

Types of Dyestuffs and Methods of Application

Before discussing the several types and methods of application of dyestuffs in the package machine, some of the factors which influence the outcome should be mentioned.

Two of these are: rate of flow and rate of exhaustion. Rate of flow can be governed by variables such as machine construction, yarn count (single or ply), pressure and type of packages. The rate of exhaustion is controlled through the use of different auxiliaries as retarding and dispersing agents, exhaustants such as common or Glauber's salt and temperature.

Levelness and penetration are directly connected to all the above and are controlled much the same way.

Some prerequisites of package dyeing are:

1. Large quantities of softened water.
2. Facilities for thorough mixing of dyestuffs and chemicals.
3. Uniformity of packages.
4. Dyestuffs of good solubility.
5. Simplicity of operations.

In the package machine, cotton may be dyed with direct, developed, vat, naphthol and sulfur dyestuffs. Sulfur colors as a class are more difficult to dye level on packages.

Direct dyes, which as a rule are substantive, are pasted in the mixing tank in a small amount of softened water, more water is added, this is then boiled for a few minutes. The necessary auxiliaries are put in to promote levelness and penetration. In the expansion tank a spring bath is prepared with more chemicals and circulated for a definite period at a temperature of 100° F. The dyestuff is then allowed to run in from the mixing tank into the expansion tank where it is filtered to a certain degree before it mixes with the spring bath. Dyeing is continued for about ¼ to ½ hour, the temperature raised, common or Glauber's salt added in two portions and then run for 45 minutes longer, dropped, rinsed and finished.

Developed colors are run much the same as the directs; except after dyeing these colors are diazotized with sodium nitrite and sulfuric acid below 70° F. for

* Presented at meeting, Rhode Island Section, February 27, 1948.

½ hour, rinsed and developed with different types of developer, soaped, rinsed and finished.

The vats present more problems than directs or develops since they require more attention and time.

There are several methods of applying vat dyestuffs to cotton in the package; namely, the reduced method, which enables dyeing with 1, 2 or 3 portions of reduced dyestuffs; the pigment method, the two-bath soluble vats, the vat-acid process and others.

The limitations and dyeing properties of a vat dyestuff such as time and temperature of reduction and dyeing, rate of exhaustion, penetrative ability, fastness properties and others, should be understood before proceeding to use it in dyeing a self shade or a compound. More particularly if in a compound, since in some cases dyestuffs of different reduction and dyeing temperature have to be resorted to in order to match a given shade.

When using the reduced method, the weighed dyestuff is either run through a colloid mill for thorough mixing or pasted up and mixed in the mixing tank. The assistants are then put in and caustic soda added. The dyestuffs and chemicals are stirred or homogenized to facilitate further mixing. Temperature of reduction is reached, sodium hydrosulfite sprinkled in and this allowed to vat for the time required. Meanwhile the spring bath which has been primed with caustic soda, sodium hydrosulfite and other assistants is allowed to circulate at the required temperature. When vatting is complete, the dye is run through a filter into the expansion tank and dyeing commenced.

The reduced method enables varying amounts of dye to be used depending on the depth of shade required. For a light or medium shade a single portion of reduced dyestuff is employed. Here all the dye is put on at one time and circulated at required temperature and for necessary time, then rinsed, oxidized, soaped and finished. For darker shades, those requiring greater amounts of dye, two or three additional portions of reduced dyestuffs are used and likewise time of dyeing is lengthened.

Pigment dyeing in package work enables level and well penetrated dyeings to be made in some cases where the reduced method seems impractical.

In using this method the dyestuff is dispersed at the required temperature with suitable assistants, and the packages mechanically impregnated with the pigment as much as possible by circulating for twenty minutes. Caustic soda is added and circulation continued for ten minutes. By this time temperature of dyeing should be reached and sodium hydrosulfite slowly sprinkled in; the sodium leuco compound is formed *in situ.* Dyeing is continued at regular temperature for one hour, then yarn is rinsed, oxidized, soaped, and finished.

Since vat dyes came into existence, men in industry have been constantly striving to simplify application processes. This research led to the discovery of the water soluble preparations of the leuco vat dyes which are marketed in this country under the name of "Algosols", "Indigosols" and "Ponsol Soluble Vat" dyes.

Quite a few vat dyes have been made into soluble form and some are being used in the package dyeing industry today, in stainless steel machines exclusively. On account of the low pH necessary for dyeing, iron machinery must not be used with this method. These dyes possess excellent solubility and level dyeing properties which are very important in dyeing pastels on packages. This type of vat dyestuff is made up with water 100-120° F. and a colloid such as sulfonated castor oil added. The spring bath is primed with ammonia 25%, a retarding agent, a leveling and dispersing agent and acetic acid 56%. This circulates cold at 70° F. for ten minutes. The dye is then added and dyeing continued for thirty minutes, during which time the temperature has been raised to 95° F. Glauber's salt anhydrous is added and dyeing continued for thirty minutes more with the temperature holding 95° F. The dye bath is dropped and the machine filled with water 50-70° F. preferably 50° F. Thiourea is added to prevent over oxidation, sodium-nitrite, an oxidizing agent is added and circulated. Sulfuric acid is then added to decompose the dye and circulated ten minutes then dropped. The yarn is then given a cold wash, an alkaline wash consisting of soda ash at 110° F. after which it is rinsed, soaped and finished.

Pastels have always been a source of trouble in package dyeing. The soluble vats have somewhat eliminated or at least helped some of the trouble. Vat grey is a shade rarely dyed in the package but which gives trouble whether it be dyed by the reduced or pigment method. Below is a typical formula for a light shade of grey made with the combination of soluble vat blue and brown:

PROCEDURE FOR DYEING ALGOSOL GREY

After boiling out yarn, fill machine and spring @ 75° F. with

1.0% Nekal NF)
.5% Ammonia 25%)
3.0% Retardine)
2.3% Acetic Acid 56%)

Add to expansion tank in order given.

Run 10 minutes @ 75° F. then add:

.18% Algosol Blue IBC Paste—Colour Index No. 1113)
.20% Algosol Brown IBR Powder—Prototype No. 118)
1.0% Sulfonated Castor Oil 50%)

Dissolve together.

Circulate 30 minutes at which time the temperature should be 95° F. Add: 10% Glauber's salt (sodium sulfate) anhydrous, dissolved.

Circulate 30 minutes—Drop Bath.

(DO NOT EXCEED 95° F. DURING DYEING OPERATION).

DO NOT GIVE ANY WASHES—Add:

.5% Dehagan III—Dissolved)
.6% Sodium Nitrite)
5.0% Sulfuric Acid 66° Bé)

Add to expansion tank in order given.

Run 10 minutes COLD—Below 65° F. Drop Bath.

Fill machine and give Cold Wash 10 minutes.

Drop Bath and give:

1.5% Soda Ash @ 110° F.—10 minutes.

Give Cold Wash 10 minutes.

Soap with 1% Olive Soap)
½% Igepon T Gel)

30 Minutes @ 180° F.

Give hot wash @ 140° F.—15 minutes, Cold Wash—10 minutes, 2% Olive Oil @ 100° F.—15 minutes.

The Kupensaure or Vat Acid Process has been used to good advantage in some cases for dyeing packages and beams where levelness, penetration and depth of shade are difficult to obtain.

Since much work has already been published on this process, viz:

1. "An Evaluation of the Kupensaure Process." Piedmont Section Contest Paper[1].
2. "Practical Experience in Vat Acid Dyeing"—J. H. Hennessey.[2].
3. "Package Dyeing in Germany"—Thomas R. Smith[3].

only a brief description of application to packages will be given here.

After dyestuffs suitable for this process have been selected, they are vatted much like the reduced method except for reduction time, and smaller amounts af caustic soda and sodium hydrosulfite are used. An organic acid such as acetic 56% is added to convert the substantive sodium leuco into the non-substantive acid leuco with a pH of approximately 5.5. The spring bath is primed with dispersing and leveling agents, then circulated. The acid leuco dyestuff is entered and circulated ½ hour. Small additions of caustic soda and sodium hydrosulfite solution are then run in slowly until the sodium leuco forms again. The remaining caustic soda and sodium hydrosulfite can then be run in without danger. Temperature ranges from 100°-165° F. over the dyeing period, when using this method, and finishing is same

as for a regular vat.

Dyeing at elevated temperatures is sometimes both necessary and beneficial, in order to improve penetration and exhaustion when using some vat dyestuffs. Much consideration must be given dyestuffs intended for use at high temperatures. Trial runs should be made to determine their suitability since deviations in shade from normal dyeings sometimes occur.

Fox[4], describing high temperature dyeing on the jig, states that 20 to 30 per cent more sodium hydrosulfite is necessary than when dyeing at ordinary temperatures. During the dyeing he also states that it is necessary to observe carefully the degree of reduction of the vat, and maintain the correct shade of the leuco compounds by additions of hydrosulfite.

Abnormally high temperatures tend to break down many vats, but it has been found that dextrine used in the dyebath helps stabilize the bath.

Extensive experiments were carried on at the I. G. Farben Industries concerning dyeing at elevated temperatures. This is evident in their publication, "Properties and Application of Vat Dyestuffs" which is one of the most complete works on vat dyestuffs. This book is now available and can be obtained from the Office of Technical Service, U. S. Department of Commerce, Washington 25, D. C.

Using their words, "It is occasionally desirable to use higher than normal dyeing temperatures, thereby increasing the migration velocity of the leuco dye and thus securing better penetration of densely woven cloth or tightly twisted yarn. Higher than normal dyeing temperatures are also used to level up uneven dyeings. Not all dyes are suitable for dyeing at high temperatures because of the danger of over-reduction, hydrolysis, molecular re-arrangement, low color yield, or excessive change in shade."

Dyeings were made at various temperatures using the chemical concentrations specified for the optimum method. When dyeing at temperatures above 140° F. they used 20 c.c. per liter of Dekol to inhibit chemical changes in the dye, except in case of those dyes which are sensitive to Dekol. The dyeings at various temperatures were compared with dyeings made by the optimum method at normal temperature and arranged in groups. The classifications are based on the relatively low concentrations of the normal dyebath and not on the concentrations of the stock vat where the temperature is distinctly restriced.

They have compiled a list of many dyestuffs which can be dyed at various temperatures without loss in strength or change in shade. Concerning ourselves with the high temperature group, below is listed a few of those mentioned which can be dyed up to 176° F.: Indanthrene Orange RRT, Red Violet RH and RRN, Blue BCS, Blue GC, Blue GCD, Blue 3G, Blue 5G, Blue RC, Brilliant Blue RCL and others.

Those which can be dyed up to 194° F. comprise the largest group, to mention a few: Yellow G, Yellow GF, Brilliant Orange GR, Golden Orange 3G, Red FBB, Bordeaux BB, Rubine B, Brilliant Violet 4R, Dark Blue BO, Brilliant Green B, Khaki GG, Brown BR, Grey M, Direct Black RB and others too numerous to mention.

Temperatures in excess of 158° F. should not be used on Blue BCS, Blue GC, Blue RC or Brilliant Blue RCL when the dyeing will subsequently be subjected to chlorine bleaching because the chlorine fastness is decreased by dyeing at too high a temperature.

Naphthol Colors

The search for a bright red of all-round fastness led to the discovery of the ice colors now known as Naphthol Dyes. Today this group contains naphthols capable of producing practically any color by using the correct mixtures and developers.

Selection of naphthols for package dyeing is very important since the substantivity ranges from 10% to practically complete exhaustion. The less substantive, as a rule, are not suitable for package work.

The alcohol dissolving method has proved very good for package work. This consists of pasting up the weighed amount of naphthol with the necessary quantity of alcohol in the mixing tank, dissolved caustic soda is then poured in and heat applied to complete solution. A protective colloid such as a 50% sulfonated castor oil is generally used to maintain a clear solution. The spring bath is primed at 90° F. with more caustic soda and a leveling agent. This is allowed to circulate for 10 minutes, then the naphthol solution is run in and circulated for one hour at 90° F. in most cases. There are some exceptions to time and temperature. Common salt is used after ½ hour circulation to promote exhaustion.

After impregnation an ice cold salt rinse under 60° F. is imperative unless hydro-extraction is available. The common salt is placed in the expansion tank, ice water run in, and the pump started immediately in order that only brine be allowed to come in contact with the naphtholated material, since it is very sensitive to water and light in this condition. After this a salt and caustic soda rinse is given before coupling, and this, like the salt rinse, removes mechanically adhered naphthol, which results in faster dyeings.

The developing or coupling bath is made up with the necessary chemicals and diazotized for the regular time, then neutralized if it is a base; or if a color salt is used a stabilizing agent is added to help dissolve the color salt and remove excess naphthol. The base or color salt, which ever the case may be, is made up with demineralized water, then diluted with regular softened water. Using demineralized water seems to aid solution by producing a better dispersion.

Before the base or color salt is added, common salt is dissolved in ice water in the expansion tank, then the base or color salt is added and mixed before circulation begins. Running time is usually ½-¾ hour at 50°-60° F. After coupling the material is soured with hydrochloric acid, rinsed, then soaped twice and in some cases three times, rinsed and finished.

References

[1] American Dyestuff Reporter 1947, Volume 36, Number 6, March 24.
[2] American Dyestuff Reporter 1947, Volume 36, Number 26, December 29.
[3] American Dyestuff Reporter 1946, Volume 35, Number 17, August 26.
[4] "Vat Dyestuffs and Vat Dyeing"—M. R. Fox (John Wiley & Sons, Inc., 440 Fourth Avenue, New York, N. Y.)

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Bonnar to Attend ISO Conference

THE AATCC has accepted an invitation from the American Standards Association to join an American delegation of technical and commercial organization to attend the first meeting of the Committee on Textiles of the International Organization for Standardization. This meeting will be held June 7th through 12th at Buxton, England, immediately following the annual convention of the British Textile Institute. The standards and testing methods developed by the AATCC now in prevalent use in the States will be offered for international recognition. Henry F. Herrmann, president of the AATCC, announces the appointment of J. Robert Bonnar as the Association's representative at this conference. Mr. Bonnar, technical director of General Dyestuff Corporation, is the Chairman of the AATCC Executive Committee on Research and the General Research Committee. In these capacities he is well qualified to present the Association's proposals on AATCC standards to this conference. As a member of the C. I. Steering Committee he will also discuss with the British Society of Dyers and Colourists unsettled issues pertinent to the joint publication of a new Colour Index to replace the 1924 Edition, now out of print and largely obsolete.

The Dyeing Industry from a Mechanical Viewpoint*

W. ALLEN TRAVER
President and General Manager, Franklin Process Co.

WHEN I was asked to speak to you tonight it was agreed that a technical paper, such as you often hear, was not required. Having had thirty-two very interesting years in the yarn dyeing business, during which time we have designed and built our own machines, I will try to give you a few thoughts and observations that I have accumulated.

As you probably know, or will soon find out, I am not a chemist, but started in an entirely different line of work, and landed up in the dyeing business by a streak of good luck. For eleven years I was engaged in heavy sheet metal and boiler work, and my first contact with the textile industry was in helping my uncle design kiers for bleacheries. While installing boilers in a bleachery he came in contact with a bleacher who wasn't satisfied with the center vomit pipe kiers which he had. As a result of their discussions, he designed and patented the first outside vomit pipe kiers. I also had the privilege of working with John Masson, of the Rosemont Dyeing Co., in trying to develop a jackspool dyeing machine.

Later on the Franklin Process Company, which was just starting, came to us to build their dyeing machines for them. In 1915 I joined the Franklin Process Company, and my duties consisted of designing, building, and selling their machines, and also looking after the dyehouse and plant maintenance.

Now the reason for boring you with this brief background of my early experience is to show you that, like many others who design and build machinery for dyeing and finishing, I had no knowledge of the dyeing business itself at that time. Another reason is that if the dyers and chemists present do not agree with my thoughts, as expressed here, they will know that as a dyer I am just a boilermaker.

As "ignorance is bliss" I was very happy with my new job, but it soon became apparent to me that for self defense a knowledge of dyeing would be required. Many dye lots came out badly, and the question always arose as to whether the dyer or the machine was at fault. More about that later.

Recently I read an article by a dye plant executive in which he explained that "There's a devil in every dye tub." Had I known that thirty years ago, it would have helped a lot. If any angels are ever present in dyehouses they have never visited us!

Let us not forget that dyeing of yarns and fabrics is a very old and very important business. Apparently man began to color textiles about as soon as he made them, and he has been doing it ever since. If you are tempted to believe that color isn't a necessity, let me remind you that during World War I the prices of dyestuffs reached fantastic figures. No one was willing to believe we could get along without them. An amusing incident that happened during the last war also illustrates this point. One of the bright boys in Washington, realizing the critical shortage of dyes, suggested that men's suits and overcoats could be made of natural wool, and not dyed. This certainly seemed like a simple solution of a difficult problem. One of the manufacturers present at the meeting went home and quietly made up such a suit and coat. At the next meeting he proudly presented the masterpiece. I understand the question was never brought up again. A soldier cannot be put in action without a properly dyed uniform. It is as essential as his gun.

For such an old and important industry it seems that the development of suitable machinery for dyeing and bleaching both yarn and cloth has been painfully slow. The first pressure dyeing machine with pump circulation was invented in the 1880's; and by 1900 only very little progress had been made dyeing materials in this type of machinery. One skein dyeing machine was brought out about 1886, and another around the turn of the century. Raw wool has been dyed for centuries in open tubs, with hand poling, and pressure dyeing machines for this type of work have come into popular use only in the last twenty-five years. Some would blame delay on the unwillingness of the dyers and chemists to embrace new methods and machines, but that is not the whole story. It is mainly that dyers are not mechanics; and most mechanics, or engineers, have had no opportunity to learn much about the dyeing business. While it is not true today, you know that in the old days dyeing was a deep, dark secret. In the 12th century, in Florence, Italy, they had dyers' guilds, which were much like modern craft unions, and the dyers all had their own secret formulas, closely guarded. Under those conditions progress was very much retarded.

A manufacturer of machine tools can test his product with his own men, in his own shop; an automobile designer can test his new ideas by driving the car himself; but how many builders of textile machinery can test their machines in their own plants, or with their own engineers? As a rule, when a new machine, or an improvement in an old one, has been developed, it is turned over to a customer for trial, and a report made on its merits. This system can have many disadvantages. To you chemists and dyers, who will be asked from time to time to take part in such trials, I ask that you give them fair and unbiased treatment for your own sake. It requires no ability to condemn things, but it sometimes requires brains and perseverance to make new products work. Too many people seem to take pride in proving that a new machine, or chemical, will not work, instead of finding out how it can be used to one's own advantage.

When we were building our first machines for dyeing raw wool I remember shipping identical machines to two different mills on the same day. One dyer reported excellent results, the other could not get a level dyeing. Some dyers reported tendering of the wool, while others claimed they made stronger and better yarn from the machine dyed wool. Some dyers using our top dyeing machines claimed they could eliminate back-washing, while others said, not so. You can see that conflicting reports of this kind are very disturbing to the designer of the

* Presented at meeting, Rhode Island Section, February 27, 1948.

machine unless he has some way of checking the results himself. I feel that it has been my good fortune to be in a position where any developments in our package dyeing machines could be tested in our own plant, with our own organization.

The original Franklin Process patent was the result of experiments made by a mill superintendent who was dissatisfied with a German tube dyeing machine his company had bought. To bring this process up to a commercially practical point later required the services of the mill superintendent, a chemical engineer and a mechanic.

When machinery is introduced into the dyehouse it is obvious that the dyer has a new problem. When a faulty dyeing comes up, as it will from time to time, he must decide whether the trouble is chemical or mechanical; and this is not always easy to determine. When dyeing raw wool, or yarn in skein form, in an open tub, any trouble could be traced to chemicals or method, but when a machine dyeing goes wrong, there is the possibility of machine failure. You see dyers should welcome new machines as they furnish an excellent alibi when needed. Seriously, though, it requires good cooperation between the dyer and the mechanical department to solve many of these cases, and the more the mechanic knows about dyeing, the better off he is. I am speaking now from thirty-two years of first-hand experience. When I recall some of my early troubles along this line, before learning anything about dyeing, I can sympathize with other machine designers who might be in the same position. On the other hand, trouble can be caused by the mechanical department, without the dyer realizing it.

I recall the following case: A piece dye kettle in a large worsted mill had suddenly started to turn out bad work. This was a monel lined machine, and an examination disclosed a perforated brass steam pipe in the back of the kettle. When the original Monel pipe had broken, the mechanic had replaced it with a brass one, not realizing the headaches he was setting up for the dyer. Indiscriminate mixing of metals in dyeing machines can cause untold trouble, and I have seen many instances of this sort. Of course stainless steel is one of the greatest blessings ever visited upon this business, and the young men entering this industry today will never be able to appreciate what he had to contend with before its invention. In the past many machines were built from some horrible combinations of metal that could not fail to create trouble, and very often the dyer never did discover the cause of his woes.

We had built machines of steel, cast iron, lead-lined, brass, aluminum, Monel metal, and nickel silver before we came to stainless steel. When peroxide bleaching was first introduced we were held back for a long time because we did not know that we could use cast iron.

At that time we had a plant in England, and while over there on a short visit I called on the officials of a large company. After considerable questioning on package dyeing the chief chemist inquired about peroxide bleaching. When told that it was being done in cast iron machines he said: "Young man, I am afraid you don't know what you are talking about". Unable to convince him, I finally told him that I could understand why a chemist might think this impossible, but also assured him that some fool who didn't know any better had tried it, and it worked. What he didn't realize was the fact that the silicate in the bath helped to coat the iron so that it became inert.

The General Manager of a large rayon plant visited us some years ago. At that time experiments were being made in desulfurizing and bleaching rayon in both cakes and rewound packages. Some success was indicated, and I asked him if he didn't think that eventually this would replace skein processing. He was most emphatic in stating that his company would *never* change to package bleaching as the quality could never equal that of skeinprocessed yarn. Today I saw an advertisement of that company describing the advantages of buying yarn processed in cakes.

I have learned never to say anything is impossible, as so many times the thing we thought impossible a few years ago has suddenly been accomplished.

Recently quite a number of radically new, highspeed machines for dyeing and bleaching cloth have been developed. Cloth formerly vat dyed at 4 yards per minute is now being handled at 100-200 yards per minute. I believe that most of these inventions have come from the laboratories of the large dye and chemical companies which have staffs of highly trained men, and adequate facilities for developments of this kind. Many of our new machinery ideas in the future may come from these sources.

Should the dyers welcome further mechanization of the industry, or should they resist it? After reading the literature describing some new automatic robot, a mill executive, unfamiliar with dyeing, might be led to believe that once he has installed this mechanical marvel he can dispense with his dyer and chemist. Fortunately for you men in those positions you know this is not so. In fact, as the dyehouses install more modern machinery, I believe they are going to require more skilled and educated men than before. While a good dyer may produce ten times as much cloth on a modern highspeed machine, don't forget that a poor man can also spoil cloth ten times faster than before, on the same set up. When we dye a 3000 pound batch of yarn right, the large dye lot is a great advantage, but when a batch like that goes wrong, you have 3000 pounds of yarn to wrestle with. The dyers should very definitely welcome these new machines as they will not only give a good man a greater chance to demonstrate his ability and knowledge, but will create a need for more skilled dyehouse executives.

Without wishing to detract from the merits of automatic devices, you must remember that while a temperature controller will hold the temperature at any point you desire, you must make the decision as to what is the correct temperature. An automotic reversing valve will conveniently change the direction of flow, but again, you must decide at what intervals you want the change made.

An old question from prospective buyers that has been asked many times is, "How good will the dyeings be from this machine?" I always answer that with another question, "How good is your dyer?" Isn't that a good deal like asking a piano salesman how well a certain make of piano will play a certain tune?

Dyers and chemists have not yet been replaced by machinery. On the contrary, I believe the need for skilled technicians increases daily. If some of the graduates of engineering schools could acquire a knowledge of dyeing and finishing, they would certainly be very useful in the development of new apparatus for this field. It is interesting to note that machines in our dyehouse, which are over twenty-five years old, are turning out much better dyeings than when they were new, not because they are seasoned, but simply because we have better formulas, better dyes and chemicals, and better methods of operation. Most of the improvements over the years have been on the chemical side.

In regard to trying out new dyes, chemicals or methods, it is easy to understand a dyer's reluctance to change his present formulas unless he is provided with some means of trying these out on a laboratory scale. When he has a good working formula he hesitates to try something new on a sizeable lot of material, with the chance of spoiling the goods. Even when he has the opportunity of laboratory testing, I believe the management of the plant should encourage the dyer to go ahead with practical size lots, assuring him that

he will not have to take the blame if the experiment fails.

Today the chemist is offered an endless number of new products, many of them excellent. His task of testing them out is greatly increased because the same product is so often presented to him under a great variety of names. Naturally each vendor of a product wants to identify it with his name, but it would be easier for the buyer if the name actually identified the chemical. I can think of one wetting agent that is listed in the AATCC Year Book under twenty-three different names. Perhaps some day the Association can help in this direction.

It is interesting to note the steady increase in demand for faster colors, and higher standards of quality, on the part of our customers. While this makes the dyers' work more difficult, it also gives the better man a greater chance to prove his worth and ability. We in the dyeing business should all encourage this trend, for better colors will promote the purchase of more colored goods; but fugitive colors, or badly dyed ones, will not bring repeat orders. Modern highspeed machinery in the mills today requires that the dyer not only color the yarn correctly, but also deliver it in excellent physical condition to withstand these highspeed operations. Our customers used to warp yarn at 60 yards per minute, now some are warping at over 800 yards per minute. Customers' demands, such as those for direct colors as fast to light and washing as vat colors, for developed colors to stand boiling, or for a good sulfur red, cannot always be met, but the steady pressure for improvement has been beneficial to all of us.

Speaking for management in regard to what we want from our laboratories, and the men in them, I would say that if they can originate in our plant new methods, formulas, and skills that are not readily available to the industry in general, they are performing most useful services for their own companies. While any dyer, or chemist, can obtain very valuable help or assistance from the dyestuff companies, or chemical manufacturers, always remember that the same information is available to your competitors. What will really put you out in front is your ability to add something more to that information.

When new machinery is installed in a dyehouse the manufacturer of the machine should be expected to furnish necessary instructions for its proper operation. The purchaser should not expect, however, that specific dye formulas can be obtained from the same source. An automobile dealer will teach you how to drive a car, but he does not select the roads for you to drive on, or the spots to visit. The gasoline dealer will do that. In our industry the dyestuff and chemical manufacturers have been more than liberal in supplying us with technical information and assistance.

When we were selling dyeing machines I was amazed to find many purchasers who called on us for information that they should have had in their own organization.

Those companies that are willing to buy new types of equipment, pioneer in the use of them, and find out themselves how to get the best results, will undoubtedly reap the richest rewards.

In our company we have had to blaze our own trails in this field, and we have been well repaid for doing it. We couldn't call someone on the telephone and ask him how to operate our machines. We have had to find out the hard way. We are still changing and improving our dyeing methods, and I hope we shall continue to do so.

The laboratory is also called upon for a certain amount of trouble shooting, and in this yarn dyeing business, that is tremendously important. Not only do we have to know our own business, we must have also knowledge of yarns and spinning, as well as some information about weaving. A customer often brings complaints to the dyer when the difficulty may be in his own plant. Patience, perseverance, and the detective ability of Sherlock Holmes are all useful in solving these problems.

The laboratory can make great savings by rechecking standard formulas, substituting new and better dyes, and while improving the quality of work, also lowering cost. We want our dyers and laboratory men to be just as salesminded as the people in the front office. Good work, and a willingness to give the customer what he desires, do more to obtain future business than hours of sales talk.

And speaking of the customer, we found this description of him the other day, and I would like to pass it on to you:

"WHAT IS A CUSTOMER?

A CUSTOMER is the most important person ever in this store—in person, by mail or by telephone.

A CUSTOMER is not dependent on us—we are dependent on him.

A CUSTOMER is not an interruption of our work—he is the purpose of it. We are not doing him a favor by serving him—he is doing us a favor by giving us the opportunity to do so.

A CUSTOMER is not an outsider to our business—he is part of it.

A CUSTOMER is not a cold statistic—he is a flesh-and-blood human being with feelings and emotions like our own, and with biases and prejudices.

A CUSTOMER is not someone to argue or match wits with. Nobody ever WON an argument with a customer.

A CUSTOMER is a person who brings us his wants. It is our job to handle them profitably to him and to ourselves.

That is what a CUSTOMER is—in your business, in our business, or in any business. Some people seem to have forgotten a few of those basic truths in recent years, but it is high time to be remembering them again."

I used to wonder why anyone wanted to be a dyer, but have decided that it must be because it is a fascinating business when it is running right and there are no complaints. Sometimes I wonder when that will be.

CALENDAR

PHILADELPHIA SECTION

Meetings: May 14, September 24, November 12, January 28, 1949 (Kugler's, Philadelphia); Outing: June 11 (Atlantic City Country Club, Northfield, N. J.)

NEW YORK SECTION

Meeting: May 7 (Swiss Chalet, Rochelle Park, N. J.); Outing: June 25 (North Jersey Country Club).

PIEDMONT SECTION

Meeting: June 18 (Ocean Forest Hotel, Myrtle Beach, S. C.).

NORTHERN NEW ENGLAND SECTION

Meetings: May 21, June 11 (Outing); September 24 (Andover Country Club); November 19.

SOUTHEASTERN SECTION

Meetings: July 24 (Atlanta, Ga.); September 25 (Columbus, Ga.); December 4 (Atlanta, Ga.).

SUB-COMMITTEES

Meeting: June 7 (Hotel New Yorker, New York).

COUNCIL

Meeting: June 8 (Hotel New Yorker, New York).

RESEARCH COMMITTEE

Meeting: June 8 (Hotel New Yorker, New York).

NEW TEST FABRICS

New test fabrics are available from Werner Klaas of Testfabrics, 224 West 35th Street, New York 1, N. Y.

Of the two sponsored by the Association, one is similar to the old Multifiber Fabric, but of firmer construction, containing filling stripes of Wool, Viscose, Spun Silk, Bleached Cotton, Celanese Acetate, and Nylon, assembled in 2 inch strips, with a waste stripe between repeats, in fabric 38 inches wide, at present price of $4.00 per yard.

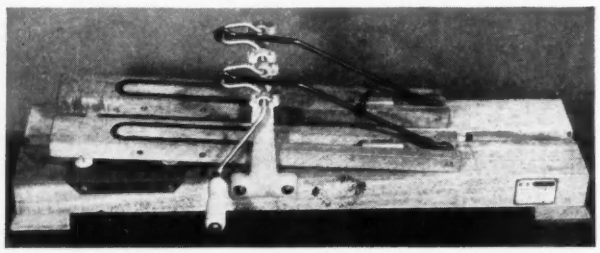
The second contains Acetate, Wool, and Bleached Cotton, so woven as to show on its surface one inch squares of Acetate and Wool and two inch squares of Cotton. This is 54 inches wide, and is for the present priced at $3.50 per yard.

Crockmeters and Crockmeter Cloth

Revised Prices

Regular Crockmeter	$20.00
Regular Crockmeter (with automatic counter)	30.00
Duplex Crockmeter	50.00
Crockmeter Squares (500)	1.50
Crockmeter Cloth (96 x 100), by the yard	.75

Regular Crockmeter



Duplex Crockmeter

Available from the National Secretary

Colour Index

It is improbable that the new Colour Index, on which the American Association of Textile Chemists and Colorists is collaborating, will be out within three years. To fill current needs the British Society of Dyers and Colourists published replicas of the Index dated 1924, and Supplement dated 1928. An allotment to the Association was sold for the most part without advertising. There remain fourteen sets, available from the Secretary, AATCC, P. O. Box 28, Lowell, Mass., at $28 each, postpaid in this country. Orders will be filled in the sequence of their receipt, with preference to ultimate users rather than book dealers.

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EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

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48-2

Education: B.S., R. I. State College.

Experience: General chemical and testing; laboratory and plant development of methods for applying dyes and textile specialties.

Age 37; married; references.

48-3

Education: B.S., with graduate work; fair knowledge of languages.

Experience: Textile chemical research, cotton dyeing, printing and finishing.

Age 26; woman, unmarried; references; vicinity of New York or Philadelphia preferred.

48-4

Education: Graduate, Philadelphia Textile Institute.

Experience: Testing dyes, etc.; chief chemist, in charge of mercerizing, bleaching and dye formulas.

Age 47; married; references; vicinity of Philadelphia preferred.

48-5

Education: B.T.C., Lowell Textile Institute.

Experience: Textile chemist and dyer, wool and cotton.

Age 40; married; references; will work anywhere in U. S.

TRADE NOTES • NEW PRODUCTS

• Superset Wrinkle Resistant Finish

The first wrinkle resistant finish which, it is stated, can be successfully applied to all types of cotton with little or no loss in tensile strength was announced recently by American Cyanamid Company's Textile Resin Department. Even seersucker when treated with this finish remains fresh after several wearings.

The new finish, which goes by the name of Superset, also is said to control shrinkage to 2 per cent or under. Wrinkle resistant finishes have been widely used for rayon fabrics but, it is stated, up to now only special constructions of cotton goods could be made wrinkle resistant because previously marketed types of finishes seriously weaken the fabric.

The new finish has already been tested for more than a year on a wide range of standard fabric constructions with plant runs of substantial yardage. Among the fabrics that have been successfully made wrinkle resistant and stabilized to give shrinkage control are: ginghams, piques, jeans, dress goods, chambrays, prints, seersuckers, cords, twills, drills, denims, corduroys, and coverts. The finish is said to be highly durable with effectiveness retained after many severe test washings.

According to Richard E. Sumner, Manager of the Textile Resin Department, melamine resin forms the basis of the new Superset finish, modified in such a way that it does not effect the strength of the fabric. Tests are said to show a very high anti-crease rating of from 3.0 to 3.6 in both warp and filling directions. In addition, a high degree of resilience is said to be added to the cotton. A wide range of hand can be obtained all the way from the softer women's wear to the firmer men's wear effects.

Fabric produced in plant runs was made into garments last summer and given extensive consumer tests. This included both men's and women's garments. It is on the basis of the experience gained during these tests as well as exhaustive laboratory tests that detailed information about the finish was obtained. It is stated that another characteristic of Superset Textile Finish which proved itself during these tests was that the treated fabrics dry cleaned excellently without any loss of the effectiveness of the finish. Another benefit of the finish is that the treated fabric handles far better during cutting and sewing. Estimates of tailors and dressmakers who have worked on the fabric are, conservatively speaking, that the Superset finished fabrics can be worked 20 to 30 per cent more efficiently.

Processing requires no special equipment other than the curing unit which is standard equipment in most cotton finishing plants. At the present time a number of mills are going into production and large yardages will be in the hands of manufacturers for their early resort lines. The new finish will reach consumers on a large scale in the spring and summer of 1949.

"The new finish is available to all mills and finishing plants, and necessary resins and technical assistance will be supplied to interested mills by the American Cyanamid Company," Mr. Sumner stated.

Chemists Position Open

The Board of U. S. Civil Service Examiners, Army Chemical Center, Maryland, announces positions to be filled at the Army Chemical Center; at Camp Detrick, Frederick, Md.; and at Aberdeen Proving Ground, Md.; by chemists with salaries from $3397 to $9975 per annum. Applications must be on file by June 2, with the Executive Secretary, Board of U. S. Civil Service Examiners, Army Chemical Center, Md., from whom further information can be obtained.

• Booklet For Knit Goods Industry

Commonwealth Color and Chemical Co., Nevins, Butler and Baltic Streets, Brooklyn 17, N. Y., announces publication of a booklet for the knit goods in-

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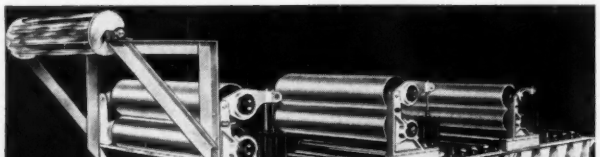
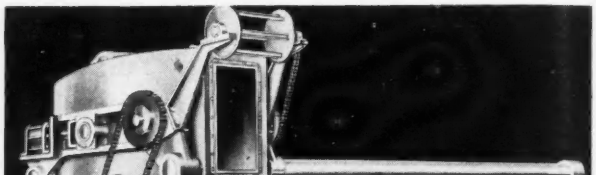
Testing American Cyanamid Company's new Superset Resin finish for cotton. In picture 1, the young lady is giving her suit jacket a severe twisting, with the help of William Masterson of the Better Fabrics Testing Bureau, to try to induce as many wrinkles as possible. In picture 2, when shaken out and put on immediately, it looks fresh and unwrinkled. In the last picture, it is all set to step out, not looking as if it had been put through a wringing. Tested on the T.B.L. Crease Resistance machine, the fabric in the cotton cord suit showed a crease rating of 3.5, whereas similar untreated fabric shows a rating of 1.2.



"Tensitrol" Open Width Washer (Above)
An application which, it is claimed, revolutionizes open width washing. It is stated that it provides tensionless operation, regardless of the number of immersion rolls and regardless of the amount a fabric may shrink or stretch. It is further stated that it handles all types of fabrics, even spun and filament acetates, at high speeds.



"Tensitrol" Rope Washer (Right)
It is stated by Rodney Hunt Machine Co. that this washer can be used for the processing of roped fabrics up to speeds of 300 yards per minute, and more, with the cloth always in a relaxed, tensionless condition, regardless of stretch or shrinkage. The unit illustrated gives the roped fabric thirty immersions with counter-current flow of water and a final pneumatically controlled squeeze.

dustry entitled "What Is Your Problem? —A Service Designed for the Knit Goods Industry". The purpose of the booklet is to direct attention to the technical service offered by Commonwealth to the knit goods industry. There are a number of illustrations which reveal the extent to which laboratory facilities have been expanded to include the latest processing and testing equipment for all types of hosiery and knit goods. It is stated that, by duplicating actual mill procedures, Commonwealth is in a position to develop accurate bleaching, dyeing, and finishing formulas which may be placed directly into use in the mill with little or no adjustment. A list of the products manufactured especially for the hosiery and knit goods industry, together with a brief summary of their uses and advantages, is included. Copies of this booklet are available upon request.

• Tensitrol Process Announced by Rodney Hunt

A new method for processing even the most delicate of fabrics continuously at highest speeds without subjecting the fabric to any tension, was announced recently by the Rodney Hunt Machine Co., Orange, Mass., at a demonstration at the Waldorf-Astoria, New York.

The invention is called "Tensitrol" and is said to permit fabrics to remain tensionless throughout continuous finishing operations, regardless of any tendency of the material to shrink or stretch, and it does this without a change in speed of any moving part of the machine.

It has already been applied in finishing machines which have been in continuous production for many months in some of the nation's largest textile plants. According to Rodney Hunt officials, it is already doing much to solve two of the industry's most perplexing problems, shrinkage and color fastness.

Excessive shrinkage, caused by yanking and stretching of fabrics during processing, is said to be eliminated by the "Tensitrol" principle. At the same time, this tensionless operation opens the way to continuous dyeing where savings in costs will permit the use of faster dyestuffs, providing higher quality goods for the consumer without higher prices, it was said by Earl F. Harris, operating vice-president of the Rodney Hunt firm.

The new principle was demonstrated with an accurate working model in which 60 strands of fabric were put through in a continuous length as in a washing operation. Tensionless operation was shown when the demonstrator hooked his finger around one of the strands while the machine was running, pulled the strand out several inches and let it run across his finger to simulate tightening or shrinking of the fabric. Instantaneously the model rope washer compensated for that shrinkage and the fleeting tension vanished. Similarly when that loop of fabric around his finger was allowed to fall back into the machine to reproduce sagging or stretching, the slack in the fabric was absorbed immediately.

Full-sized machines, after which the model was patterned, have been in operation for months in woolen, worsted, rayon and silk finishing plants, according to B. M. Jones, manager of the Rodney Hunt Textile Machinery division who conducted the demonstration. The "Tensitrol" principle has been applied to both rope washers and open width washers, he said, and procedures for use of the principle in continuous dyeing will be available soon.

The "Tensitrol" principle, which is the result of more than three years of research, was explained by Mr. Jones.

On a conveyor system in which fabric is moved over top and bottom rolls, he said, it was found that the fabric would remain tensionless if the bottom rolls were driven at a speed a certain percentage in excess of the speed of the rolls which removed the fabric from the machine. Accordingly, he explained, without any change in speed of any moving part of the machine, cloth could be run through at any speed and remain constantly in a totally tensionless, relaxed condition.

In making the first public disclosure of the "Tensitrol" principle, Rodney Hunt officials present said that it has a wide range of potential application not only in the textile industry but in any field where the tensionless handling of goods in continuous production is an advantage.

The invention is the latest in the 108 year-old history of the Rodney Hunt Machine Co. One of the principal manufacturers of textile wet finishing machinery, it introduced the "Slack Loop" principle of textile washing, which was one of the early steps toward tensionless operation.

The firm pioneered in the use of stainless steel in the early 1930's for equipment in the wet finishing field of the textile industry, and it developed the curvature principle in stainless steel tub construction.

The firm introduced an original method of using pneumatically controlled pressure rolls for textile machinery and, since 1939, has pioneered in the development of equipment for continuous peroxide bleaching for which the new "Tensitrol" washer is said to be particularly adapted because of its production speed of more than 300 yards a minute.

• Felt Association Officers

At the Spring meeting of The Felt Association held recently in Boston, Cornelius A. Hubner was elected president of the Association, succeeding Arthur N. Sudduth of James H. Rhodes & Co. Mr. Hubner is president of the Central Felt Company, New York. Lyndon S. Rosenau of Standard Felt Company (New York office) was elected vice president. Herbert S. Blake, Jr., president, Organization Service Corporation, was re-elected secretary-treasurer.

The board of directors for the ensuing year includes Messrs. Hubner and Rosenau; John T. Lawless, president of the American Felt Company; L. H. Hansel, president, The Felters Company, Boston; Herman G. Berglund, Standard Felt Company, and John Newbold, president, Continental Felt Company, New York.

Headquarters of the Association are 74 Trinity Place, New York 6.

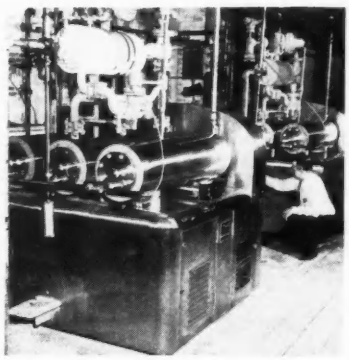
• Joins Stanalchem, Inc.

Stanalchem, Inc., New York, N. Y., Chemical Exporters and Manufacturers' Representatives, recently announced that Henry A. Wells, formerly of the Calco Chemical Division of American Cyanamid Company, has become associated with them as Manager of the Dyestuff Department. Mr. Wells, a graduate of Lowell Textile Institute, has been actively engaged in the dyeing and printing phases of the textile industry since 1933 and will devote his time to the procurement and sale of dyestuffs for the export market.

• Assistant Vice Presidents, Nopco

The Board of Directors of Nopco Chemical Company at its last regular meeting, authorized the creation of the office of Assistant Vice President, and designated the President to appoint two or more persons to serve in that capacity. Charles P. Gulick, President, announces the appointment of the following Assistant Vice Presidents: Charles I. Post, Ph.D., C. Arthur Larry and Edwin A. Robinson, Ph.D. Dr. Post will be in charge of the company's Vitamin Division, and will be responsible directly to Perc S. Brown, Vice President. In his new field, Mr. Larry will be in charge of the Purchasing Department for Nopco and all its subsidiaries, and will also be responsible to Mr. Brown. Dr. Robinson will be in charge of all Laboratories, Sales Development and Market Development Departments of the Industrial Division, and will be responsible to Thomas A. Printon, Vice President.

• Installs Votator Apparatus



Faster processing of vat pastes and improved quality of textile printing has resulted from the installation above of the newly developed Votator starch processing apparatus at the Jewett City plant of the Aspinook Corporation, it is stated by William A. Broadfoot, President.

It is said that explosion of the tiny starch particles, under closed and scientifically controlled higher cooking temperatures, produces pastes of finer texture and uniformity with a superior finished product. The new equipment is also said to reduce floor space, eliminate waste and minimize the hazard of slippery floors.

• Report on Research Projects

The development of better water repellents and shrink-resistant treatments are among current textile research projects sponsored by the U. S. Army Quartermaster Department according to a report now on sale by the Office of Technical Services, Department of Commerce.

The report which describes current areas of research in the textile field by the Quartermaster Department was prepared by Lt. Col. S. J. Kennedy, and Captains R. D. Weeks and S. Becker. The authors believe that "branches of the textile industry concerned with research will be interested in this survey."

Of the 13 objects discussed in the report, nine are fundamental studies of fibers, fabrics, and finishes. These include studies of textile resistance to wear, water, shrinkage, mildew, and fire, studies of dyeing and finishing, chemical and photochemical degradation of cellulose, classification of textile properties, and development and interpretation of test methods. Four of the studies deal with the improvement of special Army textile items, including webbing, tentage and fabrics for cot covers.

Mimeographed copies of the report (PB-86249, *Areas of Quartermaster research in textiles,* 43 pages) sell for $2.

Orders should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order payable to the Treasurer of the United States.

• 40th Anniversary with Leeds & Northrup

Charles S. Redding recently observed his 40th anniversary with Leeds & Northrup Company, manufacturers of electrical measuring instruments, automatic controls and heat treating furnaces. He has been president of the company since 1939, when he succeeded the founder, Morris E. Leeds, upon the latter's election as chairman of the board. He was feted by 90 of his associates at a dinner at the Manufacturers Country Club, Oreland.

Mr. Redding first entered the employ of Leeds & Northrup as a draftsman in 1901, soon after his graduation from Northeast Manual Training School. The company then was two years old and had only 23 employes. He left the following year to enter the University of Pennsylvania, where he was graduated a bachelor of science in electrical engineering in 1906. After teaching at the university and serving as resident manager of the Engineers Club, Mr. Redding rejoined Leeds & Northrup in 1909 as a salesman. The company then had grown to about 100 employes. In 1917 Mr. Redding was made associate sales manager and subsequently became factory manager, treasurer and vice president in charge of engineering and development. He succeeded to the presidency in 1939.

• Residized Finish

Edward J. Capuano, treasurer of the Newport Finishing Corporation of Fall River, Mass., announces the development of Residized, a new process for the finishing of rayon linings which is said to reduce residual shrinkage far below today's standard.

The Residized process is a result of five years of constant research and experimentation in Newport's research laboratories. Tests show, according to Mr. Capuano, that Residized, in addition to reducing residual shrinkage to a minimum, assures clearness of color, uniformity of color from piece to piece, from end to end, and from selvage to center, and gives a full drapy hand.

The new finishing process will be marketed and merchandized under the trade name of "Residized", registration for which has been applied for at the United States Patent Office.

Newport Finishing Corporation sales and showrooms are at 160 Fifth Avenue, New York City.

• Guide to Surface-Active Agents

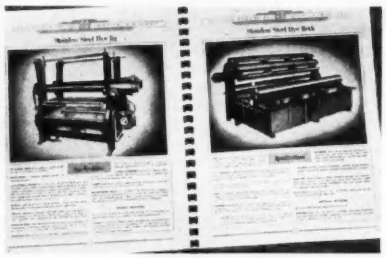
M. Michel and Company, Inc., manufacturers and distributors of chemical specialties, 90 Broad Street, New York 4, N. Y., announces publication of a brochure entitled the "Michelene Guide to Surface-Active Agents" which contains considerable of interest. Diagrams explain the chemistry of detergents, wetters, foamers, penetrants, emulsifiers, dispersants, softeners, etc.; handy charts show applications of textile auxiliaries; a comprehensive list defines over 150 uses for surface-active agents; complete data describes selected chemical specialties.

Copies are available upon request.

• Survey on Glycerine Use

According to a recent survey made by the American Association of Textile Chemists and Colorists at the request of the Glycerine Producers' Association, glycerine's most important use in the textile industry is in printing. In this study, an indicative cross-sectional view of glycerine utilization by cotton and rayon dyeing, printing, and finishing plants was obtained through questionnaires sent to a selected list of firms and individuals. One hundred and forty responses were received.

Analysis of the information given in these questionnaires shows that the responding companies use 1,262,565 pounds of glycerine during the year covered by the reports. Government figures for 1941, the last "normal" pre-war year, place glycerine consumption in textile processing for that year at 2,827,000 pounds. Since there are more than 800 cotton and rayon dyeing, printing, and finishing plants in the country, comparison of these figures would indicate a greatly increased all-over glycerine consumption by the textile industry during the last few years.



Two facing pages in the new "Modern Textile Machinery" catalog issued by Morrison Machine Company.

This statistical breakdown also shows that printing and finishing account for the use of approximately 90 per cent of all the glycerine reported. Thus 1,062,710 pounds of glycerine were used in printing, with 60,110 pounds going into textile finishing. Substantial quantities of glycerine were also employed in sizing, dyeing, and miscellaneous applications. Noteworthy is the use of 37,725 pounds of glycerine alkyd resin applications. The employment of glycerine-utilizing alkyd resins represents a rapidly expanding field of application in textile processes.

• Reports on German Dyestuff Industry

New products and processes developed by I.G. Farben towards the end of the war, screened and evaluated by U. S. industrial experts as being of importance to the dyestuff industry are now available in translated form from Research Information Service, 509 Fifth Ave., New York 17, N. Y.

Translated Reports fall mainly into the following three categories: Manufacturing Processes for Naphthol Dyes, Various Azo Dyes, and Xanthene Dyes.

It is claimed that American technical experts have found that the practical research work contained in the Reports on Naphthol Dyes and Azo Dyes particularly, is of immediate value to American manufacturers and that the products and processes described represent developments of decidedly novel character.

A complete listing of all available translated Reports in any of the above-mentioned categories as well as on Inorganic Luminescent Colors, which includes abstracts of the contents of individual Reports, has been issued by Research Information Service in the form of a Catalog entitled *Dyes & Dyeing* (Feb.-March 1948 issue). This catalog may be obtained free of charge upon request from Research Information Serrvice, 509 Fifth Ave., New York City, N. Y.

• Morrison Machine Catalog

Morrison Machine Company, 1171-1225 Madison Avenue, Paterson 3, N. J., has recently issued a catalog entitled "Modern Textile Machinery" which features many of the textile machines designed and built by this company. Information is given about the following machines: Controlled Compressive Shrinking Machine—Simplex; Controlled Compressive Shrinking Machine—Duplex; Standard Finishing Tenter—Installation; Stainless Steel Dry Cans; Triune Finishing Machine—Installation; 3-Roll Calendar; Mercerizing Tenter; Quetch; 2-Roll Padder; Stainless Steel Compartment Washer; Stainless Steel Dye Jig; Stainless Steel Dye Beck; Accessories; Williams Unit; and Williams Laboratory Unit with three Roll Laboratory Pad. The catalog is attractive in appearance and amply illustrated. Copies are available upon request.

• Promotion Director, UPDW

The United Piece Dye Works announces the appointment of Miss Adeline A. Dembeck as promotion director. Her duties will include contacts with the wholesale and retail trades using fabrics in United colors and special finishes, as well as the development of educational and promotional activities. Her headquarters will be at 132 Madison Avenue, New York City.

For the past ten years Miss Dembeck was associated with the Tennessee Eastman Corporation as executive assistant to the advertising director and fashion publicist, where she organized and directed the company's fashion market reporting, photography styling, and publicity distribution units.

Prior to this assignment she was employed for eight years in the Advertising Department of the Eastman Kodak Company in Rochester, New York.

• Technical Director, ITT

Dr. Warren F. Busse, formerly Director of Physical Research of General Aniline and Film Corporation, Easton, Pennsylvania, has become the Technical Director of the Institute of Textile Technology, it was announced recently from the office of the president of the Institute. Dr. Busse has a distinguished record in the field of physical research through his long association with the B. F. Goodrich Company, and later with the General Aniline and Film Corporation. He established the research section of the Goodrich Company to study cotton, rayon and nylon, and is credited with the development of several fatigue tests.

Dr. Busse did his undergraduate and

graduate work at the University of Wisconsin, receiving from that school the degrees of Ph. B., M. S., and Ph. D. He is the author of numerous scientific papers and the inventor or co-inventor of a number of processes presently in use in the rubber industry. He has had much contact with the textile industry through the translation to production of his developments and those of others in the research laboratories. His background, training and interests in engineering and physical studies, as they relate to textiles, suit him for the research direction of an organization having as its objective the scientific attack on problems that lie at the root of production in the textile industry.

Among the organizations of which Dr. Busse is an active member are the following: Phi Beta Kappa, Sigma Xi, American Physical Society, American Chemical Society, American Association for the Advancement of Science, Fiber Society, American Association of Textile Chemists and Colorists, Optical Society, and Electron Microscope Society.

• Spoke at CATCC

Dr. George L. Royer, Assistant Director of Physical Chemical Research of the the Calco Chemical Division, American Cyanamid Company, Bound Brook, New Jersey, presented a paper on "The Scientific Study of Rayon Dyeing", at the February Meeting of the Canadian Association of Textile Chemists and Colourists, held at McGill University on the 21st. Dr. Royer discussed the practical use of scientific methods and tools in rayon dyeing. He pointed out that the British have carried out important fundamental investigations in the application of dyes to rayon, and cited the work of Courtaulds, I.C.I., Manchester Technical College, and the work performed at the Shirley Institute. He pointed out that while some of these studies have been theoretical in their approach, they do, however, provide a necessary background for the development of practical commercial rayon dyeing.

Dr. Royer stated that, "There are still many gaps between theory and practice. We must discover ways to reconcile the thinking of those engaged in the fundamental studies of dyeing with the practical needs of the dyer". He pointed out that this is one of the aims of Calco's research and development program and with interesting color slides illustrated the progress which has been made.

He cited the recent development of the Calco Dyeometer which has made possible a rapid quantitative study of dye bath exhaustion as related to the variations that exist in the manufacture of rayon. He stated that the Dyeometer permits the investigation of such factors as temperature, salt concentration, dye concentration and liquor ratio in the dye bath.

Dr. Royer, in his lecture, discussed some of the work which has been done in the application of microscopy to the textile field. He has given several important papers on this subject before the London and Scottish sections of the Society of Dyers and Colourists.

• Quality Control Techniques

Quality control techniques for use in testing the breaking strength of textile fabrics are described in a report now on sale by the Office of Technical Services, Department of Commerce. The report describes a study conducted at the U. S. Army Philadelphia Quartermaster Depot.

Mimeographed copies of the report (PB-86250; *Determination of statistical control and related factors in the performance of breaking strength testing of fabrics,* 10 pages) sell for 50 cents.

Orders for the report should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order payable to the Treasurer of the United States.

• Joins National Bureau of Standards

Dr. Herbert Leaderman has been appointed to the Division of Organic and Fibrous Materials of the National Bureau of Standards, where he will do research on the fundamental mechanical properties of high polymers. He has previously been engaged in studies of the elastic and creep properties of rubber, plastics, and textile fibers, chiefly for the Textile Foundation and the Firestone Tire and Rubber Company. He has also done development work on wire resistance strain gages for the National Advisory Committee for Aeronautics and on radar antenna housings (radomes) at the Massachusetts Institute of Technology Radiation Laboratory.

Dr. Leaderman received his bachelor's degree from the University of Cambridge in 1934 and began his work on rigid plastics at the laboratory of Aero Research Limited, England. This work was continued during the academic year 1937-1938 at the Massachusetts Institute of Technology as a visiting fellow. From 1938 to 1943 he was a member of the staff of M.I.T., where he was engaged in research on the mechanical properties of textile fibers and rubberlike plastics for the Textile Foundation. From 1943 to 1946 he was associated with the M.I.T. Radiation Laboratory. He comes to the National Bureau of Standards from the Firestone Tire and Rubber Company, where he did research on the elastic and creep properties of rubber.

He is a member of the American Physical Society, the American Chemical Society, the American Association for the Advancement of Science, and Sigma Xi.

• New Laboratory, U. S. Testing Co.

A complete new laboratory to serve West Coast industry was opened in Los Angeles, April 15, by the United States Testing Company of Hoboken, New Jersey. It is located at 1236 Maple Avenue under the management of F. P. Brennan, one of the Company's engineers.

In announcing this addition to the Pacific Coast's scientific facilities, Mr. Brennan said, "At the outset we will be fully equipped for all types of textile testing, as well as general chemical analysis. We have brought to Los Angeles many pieces of apparatus specially designed by our own engineers and produced in our own Instrument Division in Hoboken, as well as standard equipment.

"The laboratory equipment includes a Fade-Ometer, Gas Fading Chamber, Flammability Tester, textile testing equipment, washability and dry cleaning apparatus, and chemical supplies. We are also equipped to conduct the following tests—microscopic, hydrostatic, spray, hosiery and fabric abrasion tests."

• Heyden Safety Record

Unusual safety records set by the Heyden Chemical Corporation plant at Fords, N. J., have received special recognition recently.

As of the end of March, 1948, plant employees had worked 316 days, or more than 440,000 man-hours, without a lost-time accident. Since this perfect record began June 16, 1947 and was continuing in March of this year, it resulted in the plant receiving a Merit Award in the 20th statewide Interplant Safety Contest sponsored by the New Jersey Department of Labor and the New Jersey Industrial Safety Committee. This contest covered the period from October to December, 1947, inclusive, and Heyden's award came in Class 2, Group CL, covering light chemical manufacturers with 125-400 employees working 65,000 to 200,000 man-hours.

A record almost as imposing which extended from Nov. 1, 1946 to June 15, 1947 and covered 306,713 man-hours before a minor lost-time accident broke the skein, was recognized last month when a testimonial certificate was presented to plant employees through the Safety Committee and E. R. Herrick, plant superintendent. This award was made by C. A. Dalrymple of Newark, district engineer of the American Mutual Liability Insurance Company.

In presenting the certificate, Mr. Dalrymple pointed out that the excellent record had been achieved by active participation of management, supervisors and workers in their safety program.

• New Bulletins on Textile Resins

Two new bulletins on textile resins have been announced by American Cyanamid Company's Textile Resin Department. Based on the experience gained through the rapid increase in the use of resins for finishing that has occurred in recent years, the bulletins contain information on best ways of handling and caring for resins in the mill and finishing plant.

Textile Finishing Bulletin 118, "The Procedure Governing Care of Resins," suggests desirable procedure to be followed to prevent spoilage of resins during storage in the plant.

Textile Finishing Bulletin 119 discusses health safeguards in the finishing plant.

The bulletins are available upon application to the Textile Resin Department, American Cyanamid Company, Bound Brook, New Jersey.

Book Reviews

Textile Brand Names Dictionary

1947. 380 pages. Size 6½ x 9½. Cloth. $6.00. Textile Book Publishers, Inc.

This is an authoritative listing of more than 4000 fiber, yarn, and cloth brand names and their trade-marks. The main portion of the book is the alphabetical listing of the names, with their serial numbers, dates of claim, the product or products which they represent, and the company-owners. In each case the trade-mark appears beside the name for ready reference. This information was obtained from the U. S. Patent Office and appeared in the pages of the *Rayon Textile Monthly* during the years 1934 to the early part of 1947.

Part II is a unique classified section. Here the brand names are re-grouped under 12 main textile headings: Coated Fabrics, Cotton Goods, Knits and Laces, Linen Goods, Nylon, Pile Fabrics, Rayons, Ribbons and Elastics, Silks, Synthetics, Wool and Worsted Goods, Yarns and Threads. This is the only book, to our knowledge, which has offered a classified arrangement of textile brand names.

Part III is an alphabetical list of the companies in whose name the registration was made, together with the page numbers on which their brand names appear in the main section.

The book offers a valuable and desirable record of the industry's brand names for mills, manufacturers, converters, buying offices, and the retailers of textile garments and products. For identifying a name or choosing a new one, textile men and patent attorneys will welcome this handy dictionary. For the ready identification of fabrics together with their company-owners, all textile men including the retail salesman will find in this dictionary the quick answer to many of his searches and queries.

Food Products

By Saul Blumenthal, Consultant Food Technologist, Shirley Laboratories. 986 pages. Price $12.00. Published by the Chemical Publishing Co., Brooklyn, N. Y.

This is a comprehensive manual in regard to foods, their use, composition and preservation. The author has compiled the results of his many years' experience in the manufacture of foods, and methods developed and used by other specialists in this field.

Food is discussed from a technological point of view, and the chemical, bacteriological, and physical principles which must be followed carefully are covered with detail.

Tested formulae are given for the preparation of hundreds of different foods.

This book should prove valuable to every industrial establishment that runs a private cafeteria.

Powder Metallurgy Principles and Methods

By Dr. Henry H. Hausner. 66 tables, 66 figures. 307 pages. Price $7.00. Published by Chemical Publishing Co., Brooklyn, N. Y.

Powder metallurgy is one of the most recently developed branches of metallurgy, and is being found extremely useful not only in metallurgical establishments but also in laboratories. Forty-nine commercially available metal powders and their application are described.

Powder metallurgy as defined by the author is the art of producing metals by heat treatment of compressed metallic powders. In general the results obtained by this method are identical with commonly used method of melting. It is found that in many instances, physical properties unattainable heretofore can be developed through powder metallurgy.

The book is divided into three parts: Part I—General Data on Powder Metallurgy, 53 pages; Part II—Graphs and Tables on Powder Metallurgical Methods, 110 pages, and Part III—Bibliography on Powder Metallurgy, 139 pages, with 1064 separate references.

Patent Digest

(Continued from Page 290)

matter can be used is that of hollow tubes. The inventor suggests to apply this kind of baths preferably in reoxidizing and soaping at the same time different vat dyes.

References:

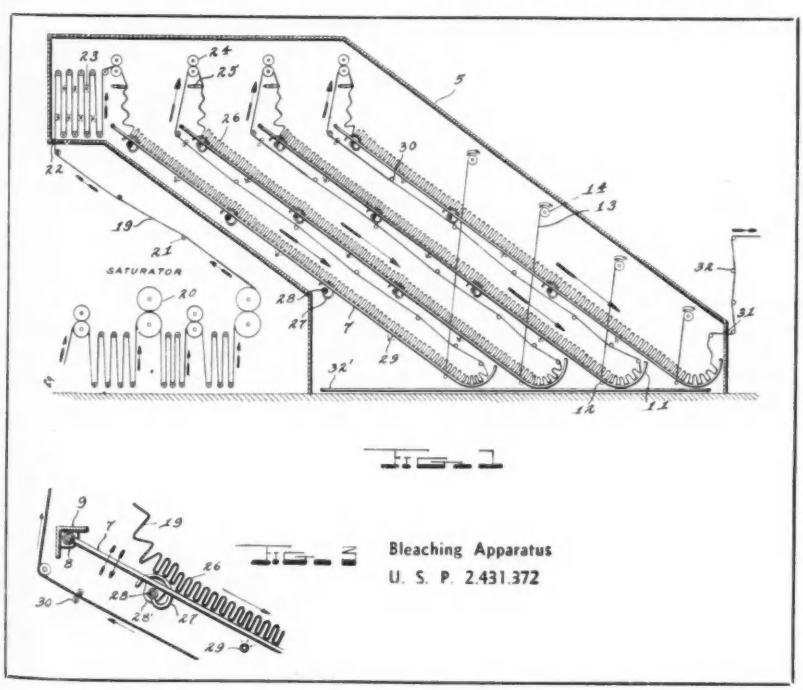
The effect is the more surprising as up to now it was felt that air by itself might not be sufficient for re-oxidizing vat dyeings (see Am. Dyest. Rep. XXIV, 13, p. 364, Davidson).

A process for dyeing vat dyestuffs in a foaming bath consists according to Ger. P. 653,305 (Zittauer Masch. Fab.) of pasting dyestuffs with water and adding soap as a foaming agent. The difference is that the foaming bath is applied in the German publication for dispersing dyestuffs, not for re-oxidizing the reduced compounds.

Bleaching Apparatus, Treating Fabrics in the Open Width B, 3, 02

U. S. Pat. 2,431,372
(Cook, McSpadden, Thornburg, Nov. 25, 1947)

The apparatus protected by this invention provides a treating chamber for freely guiding the open width fabrics over a series of inclined open slides. Textile fabrics are processed continuously and treated in this apparatus in bleaching as well as in desizing operations. A plurality of open spaced inclined slides (7) (see Fig. 1) are mounted hinged at their upper ends in bearings. The slides consist of a series of parallel bars or rods. They are curved upwardly as shown for instance at (11). The fabric (19) passes over guide rollers (21) and enters the apparatus through a slot (22) Here it is sprayed at (23) with an appropriate liquid. By further passing through the draw rolls (24) and over a plaiter (25) it falls on the first slide in a rippled condition (see 26). The most important feature of this invention is seen in the rotating kickers (27) (see Fig. 3) which are arranged beneath the slide, assisting in the downward movement of the fabric and assuring its uniform flow. As it moves from the first slide to the second set of draw rolls it is stretched out by rolls (30) straightened and smoothed before it enters the draw rolls placed above the next slide. Thus the danger of marks from folds remaining at the same place of the fabric for too long a time is eliminated. A further advantage consists in the arrangement of flexible cables (13), suspended from winding drums (14). This construction permits of accommodating the speed of the fabric to various weights of the material by raising and lowering the slides thus lengthening or shortening the path of the textiles treated. The atmosphere in the chamber (steam, hot air, etc.) can penetrate all the fibers equally at the same time because of the arrangement of spaced rods forming the conveyor.



Bleaching Apparatus
U. S. P. 2,431,372

References cited by the Patent Office are amongst others:

U. S. Pat. 2,338,649 (Kutil): describes a sifting and assorting screen intended for assorting coal and separating the different sizes by contacting the material with egg-shaped agitators which force it through openings of an endless conveyor belt.

U. S. Pat. 295,305 (Mathieson Alkali Wks.): a fabric passes through a steam chamber. It is guided in folds to a conveyor consisting of *parallel spaced ropes*, giving free access to the steam to all parts of the textile material.

Other references are:

It might be interesting to note that a device for treating fabrics, patented in Brit. P. 460,306 (Ridgeway, Hannay, Berry) works just in the inverse sense: the textile material is led upwards and drops freely down from the upper end of one slide to the lower end of the second slide. This device is intended for *drying fabrics* only.

The Ger. P. 639,453 (Proctor & Schwartz) describes a drying apparatus, characterized by an endless conveyor, consisting of parallel transverse rods transporting the fabrics in curves up and down.

Printing Device, Mechanism for Feeding Fabrics D, 3

Re-Issue 22,942 to U. S. Pat. 2,281,211
(Rice Barton Corp., Stafford, Nov. 25, 1947)

The inventor relates to a mechanism for presenting a fabric to a textile printing machine and especially for securing an accurate registration of the fabric with the engraved surface of the printing roller. The standard procedure comprises a roller, mounted on a shaft, carrying a brake drum and having a weighted strap applying pressure to this drum. Because the speed of this roll increases when the fabric is unwound it is difficult to regulate uniformly the quantity to be fed to the printing machine. The object of the present invention is to feed the fabric under uniform tension, at even width and in registration with the printing roller. This is achieved by leading the fabric from a roller (A) to a conveyor belt (B), forming regular folds on the belt running over rolls (31, 32 and 33), carrying it over a spreading device (C) and over a tensioning device (E) to the printing roller machine (D). An analogous device is provided for introducing the back gray from roller (J) over conveyor (K) etc. to the machine (D). The movements of the roller (36-37) and (51-52) respectively are co-ordinated in such a way that the quantity of the fabric fed to the conveyor is in a slight

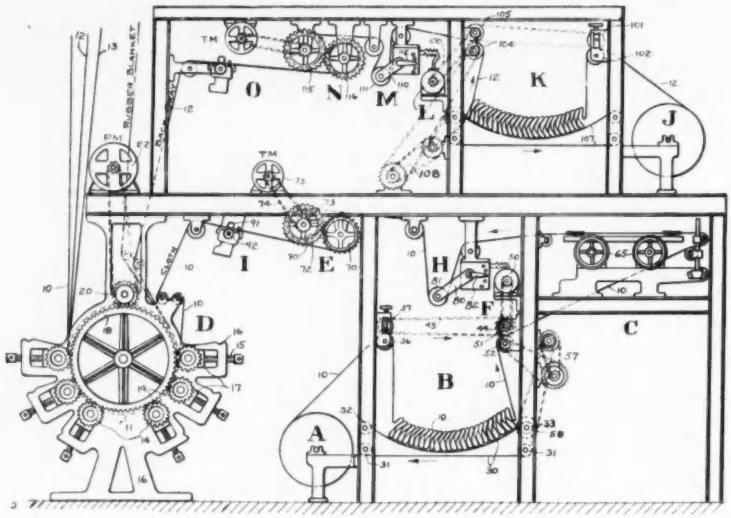
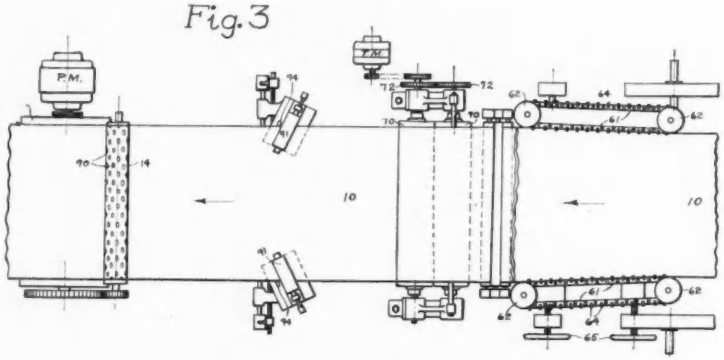


Fig. 1

Fig. 3



Printing Device, Re-issue 22,942

excess of that withdrawn on the other end. Thus ample time is given to the operator for sewing the end of a fabric to the forward end of another fabric. It is not necessary to stop the machine in changing the rollers carrying the cloth whereby generally defective marks on the printed fabrics result on every standstill. Another advantage is mentioned in the specification: besides the feeding mechanism, a tensioning device (E) is provided, moving in connection with the feeding mechanism (A). It consists of two drums (70), holding the fabric normally under a constant tension. This speed is also coordinated with variations of the movement of the fabric at the outlet of (B) by the synchronizing mechanism (H). Finally the fabric is aligned with each of the engraved print rollers by passing over an automatically guiding device, known by itself. A preferred guiding device is the apparatus described in U. S. Pat. 1,569,077 (1926) by Durrand, who was first to recommend the use of two pairs of rollers, the upper one rotating in constant contact with the fabric while the lower one is only set in action when the fabric moves out from the regular path, bringing the corresponding side of a tenter frame again in contact with the selvedge of the fabric. The device used here is illustrated in Fig. 3 of the specification, but any other guiding mechanism may be used for this purpose.

References cited by the Patent Office are amongst others:

U. S. Pat. 2,170,578 (Sperry): protects a stretching and guiding apparatus, consisting of two pairs of rollers and feeler member which acts in the same way as described above.

U. S. Pat. 2,158,027 (Unit. Merchants & Manuf.): recommending a combination of a printing machine and a tenter frame. The cloth is guided by photoelectric cells.

U. S. Pat. 2,033,625 (Anaconda Wire and Cable Company): describing a self regulating electrically operated tensioning apparatus.

Other References, regarding earlier work, done in this field:

The Rice Barton Corporation obtained U. S. Pat. 1,975,981. It is characterized by the feature of the arrangement of a large central gear meshing with gears of every single printing roller. A machine of this type is also used according to the present specification.

A device for limiting the lateral movement of fabrics before feeding them into the printing machine has been described in Ger. P. 553,269 (Soc. Alsacienne de Constructions Mec.): two back grays are placed one above the other which can be laterally guided by known means. They overlap at a desired width, carrying the fabric. Thereby no excess color spreads on the edges on the non engraved portions of the printing rollers.

—♦ ♦—

Abstract

A new steam ageing method for Developing Cibantine, (Indigosol) colors

Prof. Dr. Robert Haller, Riehen, Switzerland, "Teintex", Paris, Oct. 15, 1947, p. 335-337.

The different printing methods for Cibantine dyestuffs (sulfuric acid esters of leuco vat dyestuffs) are based on two principles of development. The steam ageing method is generally preferred although not always a full yield of the shade can be attained. An oxidizing agent which has not been proposed in this technique up to now comprises a mixture of sodium bromide (NaBr) and sodium bromate $NaBrO_3$ which composition has been recommended by the late Dr. Erban in "Farber-Zeitung" 1905, p. 337, for discharging indigo dyeings (instead of sodium chlorate). The results obtained by using these agents for developing the Cibantine color prints are very satisfactory and quite regular with only a few exceptions. A simple formula for preparing an appropriate mixture of sodium bromide and bromate is offered: NaOH 32° Bé is saturated with bromine at 60-70° C. When no more bromine is absorbed the solution is concentrated on the steam bath. A crystalline mixture of these salts is obtained which can immediately be used in the oxidizing process. By adding acid (organic acids included), bromine is liberated exerting a strong oxidizing reaction. The Cibantine dyestuffs are printed by adding ammonium sulfate as an acid generating agent, ammonium vanadate as a catalyst and the bromine salt mixture (2% of the printing paste). A table gives a survey of the formulas which proved best for the single Cibantine brands. The pastes contain starch tragacanth as a thickener and in certain cases glycerin and urea as solvents and dispersing agents. The prints on cotton have to be aged for 7 minutes, those on spun rayon for 14 minutes, rinsed and soaped at the boil. Certain (orange, red, brown and pink) shades are somewhat darker when fixed by the chlorate method while other colors (blue and green) are equivalent when fixed with either chlorate or bromate.

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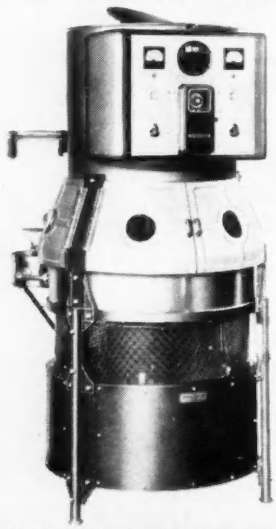

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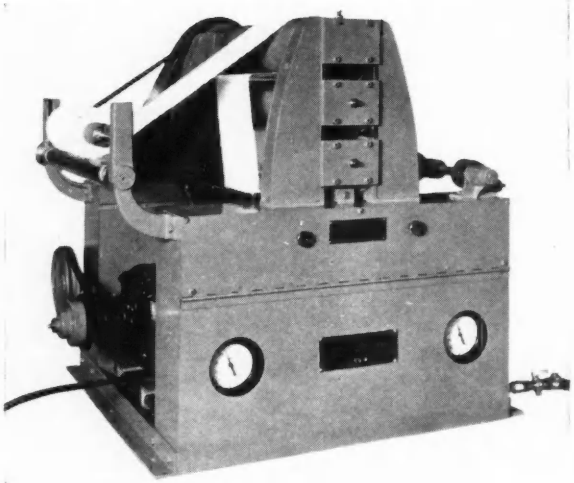

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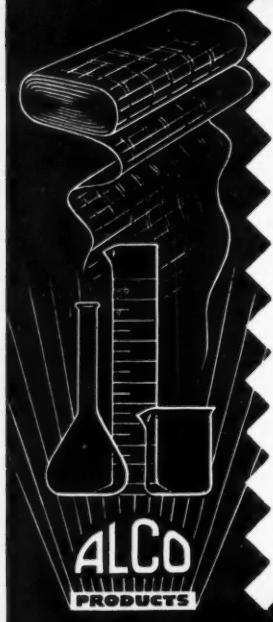

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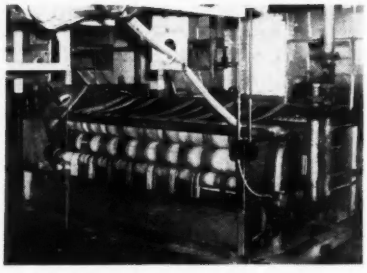

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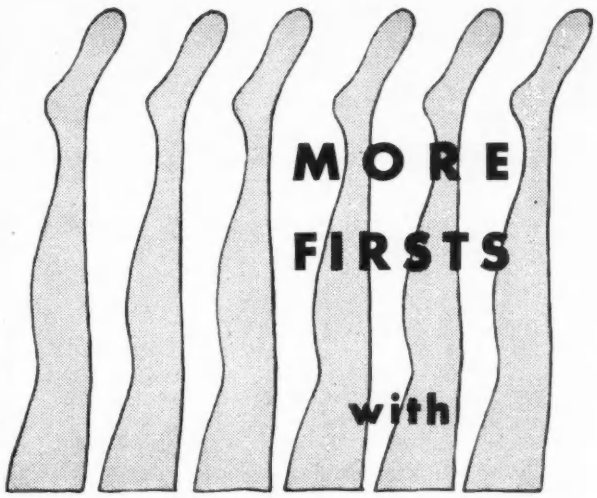

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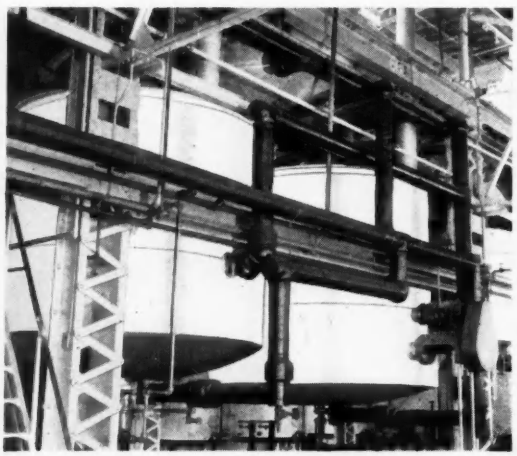

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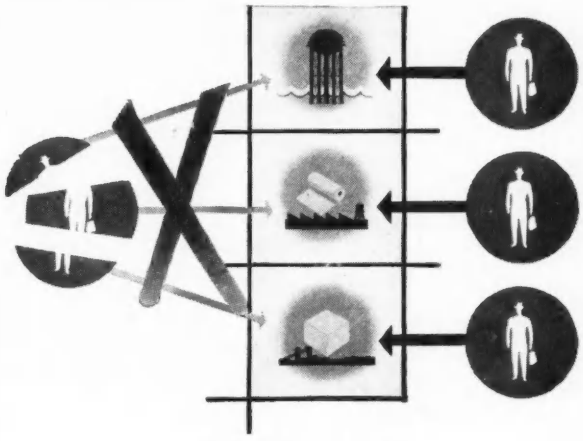

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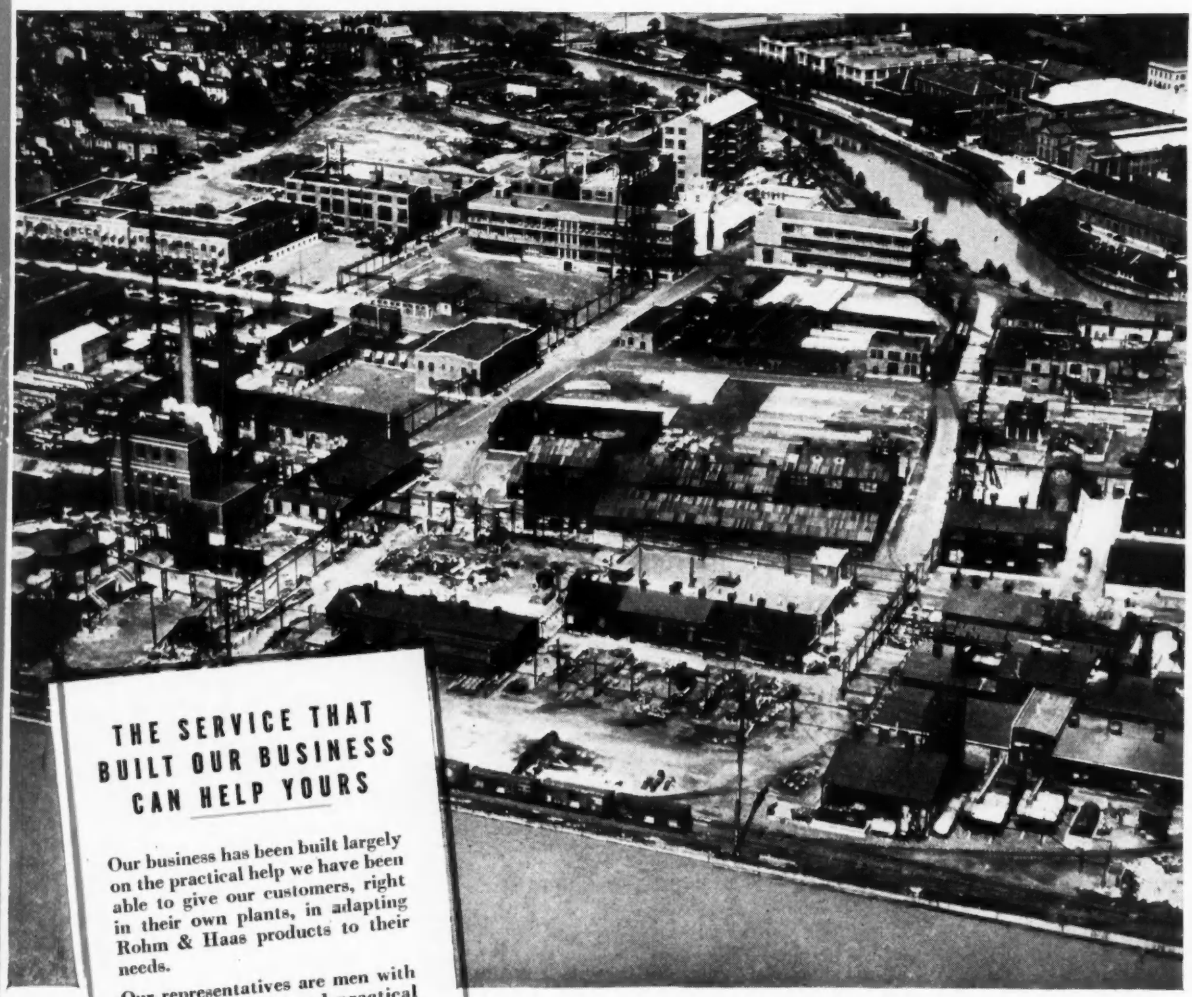

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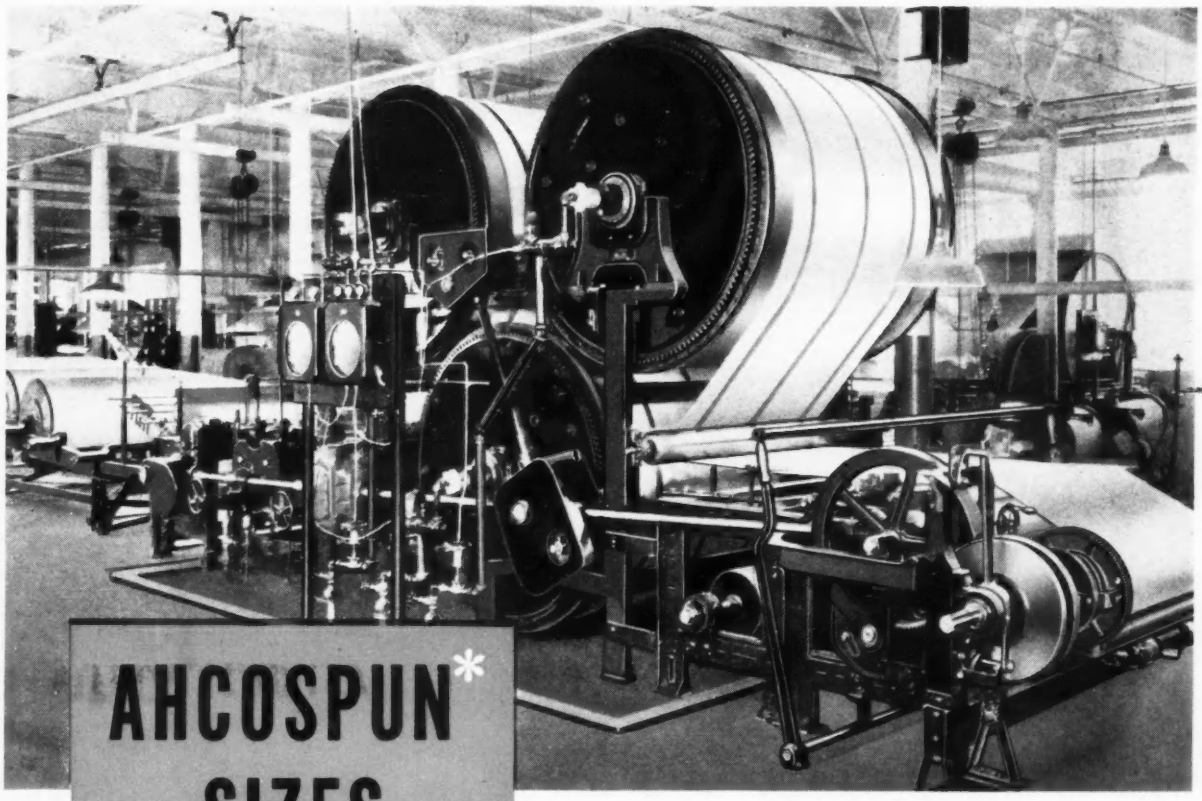

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